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ENDÔ (S.). **Comparative studies on the morphology and physiology of Japanese and Philippine Hypochnus as well as Hypochnus solani.**—*Agric. Studies*, xiv, 3 pp., 1930. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 4, p. (89), 1931.]

Further comparative studies on the morphology, temperature relations, and effect on the host [rice] of *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, x, p. 815] and the Philippine fungus placed by Palo in the *Rhizoctonia* [*C.*] *solani* group confirmed the evidence previously obtained by the writer as to the identity of these two organisms [ibid., vii, p. 266]. *C. solani*, of widespread occurrence in Europe and America, was found to differ from *C. sasakii* in various respects.

NAGAI (I.) & IMAMURA (A.). **Morphology of the 'neck' of the panicle as related to the resistance against blast disease in Rice varieties.**—*Ann. Agric. Exper. Stat. Gov.-Gen. Chosen*, v, pp. 289–304, 3 pl., 1931. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 4, pp. (101)-(102), 1931.]

The examination of the anatomical structure of the neck of the panicle in 76 rice varieties disclosed extensive differences in the number of stomata in this region. The greater the number of stomata in the neck, the lower was the degree of resistance to blast [*Piricularia oryzae*: *R.A.M.*, ix, p. 556; x, p. 337]. It was further shown, however, that foreign rice varieties, notwithstanding their larger number of stomata, are more resistant to blast than Japanese ones, indicating that some other factor may be involved in reaction to the disease. The number of stomata was found to be increased by abundant manuring.

MURRAY (R. K. S.). **Diseases of Rubber in Ceylon.**—Booklet issued by Rubber Res. Scheme, Ceylon, 38+vi pp., [? 1931].

This booklet, primarily intended to be a manual for planters, gives notes on the symptoms and control of the chief diseases (arranged by the parts of the tree attacked) of *Hevea* rubber in Ceylon. The diseases and pests of cover crops are briefly dealt with in a separate

section, and an appendix contains recommendations for the preparation and application of certain fungicides and disinfectants. Most of the information contained in this publication has already been noticed from time to time in this *Review*.

SANDERSON (A. R.). **Annual Report 1930. Pathological Division.** —*Ann. Rept. Rubber Res. Inst. Malaya, 1930*, pp. 82–88, 1931.

In this report, which is on similar lines to that for the previous year [*R.A.M.*, ix, p. 739], brief popular notes are given on the diseases of rubber prevalent in Malaya during 1930, the chief investigations conducted during the same period being listed.

The two most important root diseases in Malaya remain *Fomes lignosus* and *F. pseudoferreus* [loc. cit.]; there is little doubt that the latter tends increasingly to become the limiting factor in old rubber areas, and largely on account of this fungus and the reduction in stand and decrease in crops brought about through its agency, replanting programmes for old rubber areas will, in many cases, have to be reconsidered before long. Investigations still in progress demonstrated clearly that *F. pseudoferreus* may be present in a very active state in six-year-old rubber; unless control is established promptly, the fungus becomes increasingly harmful.

Attacks by *Helminthosporium heveae* [ibid., ix, p. 127] were frequently very severe in nurseries, and occasionally in young clearings less than eighteen months old. A long drought was a very important contributory factor to the severity of this disease.

STANER (P.). **Quelques maladies de l'Hévéa.** [Some diseases of *Hevea*.]—*Bull. Agric. Congo Belge*, xxi, 3, pp. 649–658, 8 figs., 2 diags., 1930. [Received September, 1931.]

Brief notes are given in popular terms on the identification (by means of a short analytical key of the symptoms) and control of the following root diseases of *Hevea* rubber in the Belgian Congo, viz., *Fomes lignosus*, *F. lamaoensis*, *Ustulina zonata*, *F. pseudoferreus* [see preceding abstract], and *Sphaerostilbe repens*, as well as of the abnormal physiological condition that results from excessive soil moisture. There is a short account of a case of polyphagous parasitism by *F. lignosus*, in which the fungus had extended from a rotting *Ficus* stump to *Hevea*, *Leucaena glauca*, and cacao trees, all in the same line of extension. The roots of the affected cacao trees were only attacked on the one side, and the trees were not killed, though they were bent over at the collar. The paper concludes with a description of a disease noted on the trunk of a 25-year-old, untapped *Hevea* rubber tree, which showed the presence of a diseased area of the bark extending to a height of 60 cm. from the ground. The bark, phloem, and cambium were necrosed and the surface of the lesion was covered with plaques of a zonate, pearly-white, white-edged species of *Corticium*, the spores of which measured 8 by 3 μ. As the old sporophores dried up new ones progressively appeared.

NORMAN (A. G.). **The biological decomposition of plant materials. Part IV. The biochemical activities on straws of some cellulose-decomposing fungi.**—*Ann. of Appl. Biol.*, xviii, 2, pp. 244–259, 2 graphs, 1931.

The purpose of the investigation described in detail in this paper was to determine the biochemical activity of soil fungi in the decomposition of plant residue, as tested by their individual action in pure culture on oat straw in contrast to decompositions effected by a mixed microflora at various temperatures [cf. *R.A.M.*, x, pp. 550–552]. The results of experiments in which the following organisms isolated from rotting straw were used, *Trichoderma* sp., *Phoma* sp., *Aspergillus flavipes*, *A. fumigatus*, *A. nidulans*, *A. niger*, *A. terreus*, *A. versicolor*, and *Actinomyces* sp., indicated that all these fungi decompose cellulose to a considerable extent, though none of them develops appreciably on cellulose-agar plates. Certain minor differences in ability to utilize the carbohydrate constituents were observed, but in general all substances, with the exception of the lignin, were attacked to a degree relatively proportional to the apparent total loss of organic matter. No correlation was detected between the 'nitrogen factor' (i.e., the amount of nitrogen immobilized by 100 gm. straw rotting with a particular organism) and the loss of organic matter or of any particular constituent of the straw, the differences in this factor appearing to be inherent varietal characteristics of the species employed. Some indication of the relative efficiency of the various organisms was obtained from a factor representing the amount of nitrogen immobilized as microbial protein in the course of the removal of 100 gm. organic matter from any given plant material; it is pointed out, however, that this factor, for which the name 'nitrogen equivalent' is suggested, it not of absolute value, but only approximate, and varies from material to material according to the availability of the carbohydrate constituents to the microflora involved in the process of decomposition.

WAKSMAN (S. A.) & MCGRATH (J. M.). **Preliminary study of chemical processes involved in the decomposition of manure by Agaricus campestris.**—*Amer. Journ. of Botany*, xviii, 7, pp. 573–581, 1931.

An account is given of investigations carried out at the New Jersey Agricultural Experiment Station to elucidate the chemical changes occurring in the process of composting horse manure preparatory to inoculation with the edible mushroom, *Psalliota campestris*, as well as those taking place during the actual growth of the mushroom from the spawn inoculated into the composted manure.

The four chief constituents of the organic matter of the manure are the cellulose, the hemicelluloses, the lignin, and the protein. The hemicelluloses were found to undergo the most rapid decomposition during the early stages of composting before the introduction of the spawn, and there was relatively less decrease in them while the mycelium was growing, indicating that this group of substances does not form a very important nutrient for the

growth of *P. campestris*. In the case of cellulose, however, the relative concentration only began to decline after the introduction of the spawn, suggesting that this constituent may play a part in the nutrition of the mushroom. Furthermore, during the period of active mushroom growth there was a rapid reduction in the lignin and protein contents, whence it may be inferred that both these groups are utilized by the fungus.

MARTIN (J. P.). **Pathology.**—*Proc. Hawaiian Sugar Planters' Assoc., Fiftieth Ann. Meeting, 1930*, pp. 437–451, 1931.

Field observations and laboratory tests have shown that the P.O.J. 2878 sugar-cane variety is much more resistant to eye spot [*Helminthosporium ocellum*: *R.A.M.*, ix, p. 681] than H. 109. Young plants of the latter variety were grown at the pathology plot in solutions containing different ratios of calcium : magnesium, calcium : potassium, and calcium : sodium. The number of eye spot lesions resulting from inoculation with the spores of *H. ocellum* was reduced when the magnesium, potassium, or sodium were in greater amounts than the calcium. Comparative inoculation experiments with *H. ocellum* and the brown stripe fungus [*H. stenospilum*: ibid., viii, p. 134] showed that the former produces lesions within a few days, while the latter requires a much longer period. C. W. Carpenter has obtained the ascospore stage of the brown stripe fungus, which proved to be a species of *Ophiobolus*. Inoculations with single spore cultures from the cultures containing the perfect stage were successful and the fungus was reisolated from the resulting lesions.

C. W. Carpenter states that practically all cane land in the 'growth failure areas' is now occupied by varieties resistant to the form of root rot caused by *Pythium aphanidermatum* [ibid., ix, p. 681]. In pot tests the P.O.J. 2878 has shown a degree of resistance to this disease comparable to that of H. 109.

The symptoms of pokkah boeng [loc. cit.] were readily induced in rapidly growing cane by injecting the spindle with spores from pure cultures of a fungus of the *Fusarium moniliforme* [*Gibberella moniliformis*] type which has been tentatively identified as *F. moniliforme* var. *subglutinans*.

Definite red stripes were observed on P.O.J. 2878 in Kawela Field, Molokai, and several bacteria were isolated from the diseased material. With one of these, lesions similar to those occurring in nature were reproduced by artificial inoculation. The organism was found to differ widely in cultural characters from the causal organism of red stripe (*Phytomonas rubrilineans*) [ibid., ix, p. 406].

Attention was first drawn to a chlorotic leaf streak, now known as chlorotic streak disease, in October 1929. The cause has not been established by laboratory studies, but field observations have shown that infection is readily transmitted by cane cuttings, thus showing that it is systemic. Chlorotic streaks with irregular or wavy outlines are conspicuous on the older leaves, the lesions on the young foliage being somewhat indefinite. The symptoms of chlorotic streak are similar to those of the 'fourth disease' in Java [ibid., ix, p. 271], the cause of which is stated to be unknown.

AGATI (J. A.). **Studies on the root-rot of the Sugar-Cane seedlings in the nursery.**—*Philipp. Journ. Agric.*, ii, 1, pp. 1–26, 5 pl., 1931.

Sugar-cane seedlings in the Philippine Islands are seriously affected by a root disease caused by a species of *Pythium* first observed in October, 1929, on hybrid seedlings [*R.A.M.*, x, p. 96], viz., Co.205 × Hind's Special, Hind's Special × H. 109, H. 109 × P.O.J. 2878, D. 152 × P.B. 118, and P.O.J. 2878 × D. 152. The fungus attacks the Negros Purple, H. 109, and Badila varieties in the field. The tissues at and near the tips and other tender parts of the young roots are invaded. The diseased tips become watery and flaccid, while the whole root system is abnormally branched and stubby and may show brown lesions. Infected plants are generally stunted, with chlorotic, wilted leaves. Small infected seedlings die out suddenly. After the pricking stage, at which infection is liable to occur, the tendency to root rot is greatly reduced and many of the transplants may survive if immediately transferred to uninfested soil. In the field the root rot is commonly observed on six-month-old ratoons.

The causal organism is readily isolated from the cane roots, and produces in culture an abundant white aerial mycelium; numerous terminal oogonia ranging from 24 to 35 μ in diameter; terminal, subterminal, or intercalary, barrel-shaped antheridia, sometimes furnished with a crooked or protuberant neck, and making narrow contact with the oogonium to which two or more may be applied; spherical oospores 20·4 to 31 μ (average about 25 μ) in diameter; and (in water) irregular, oval or globular, swollen presporangia liberating zoospores freely under favourable conditions. The optimum temperature for development appears to lie between 20° and 30°, with a minimum and maximum at 15° and 35°, respectively. In inoculation experiments on maize seedlings *Pythium* infection increased in proportion as the temperature sank from 30° to 15°. The fungus was found to develop over a hydrogen-ion range of P_H 5·3 to 9·6, the optimum lying between P_H 7·0 and 8·3. It is closely related to *P. aphanidermatum* [see preceding abstract] but its exact identity has not yet been determined.

Promising results have been given by experiments in the control of root rot by soil sterilization (baking for 2 to 3 hours at 100° C. or above, or scalding with boiling water) and disinfection with formalin (1 in 50) or sulphuric acid (7 c.c. per 500 c.c. water).

The effect of soaking seed-pieces upon germination.—*Sugar News*, xii, 7, pp. 436-440, 1 diag., 1931.

In an experiment planned by H. A. Lee and conducted with the co-operation of M. Medalla, B. Desembrana, and D. Gonzaga, it was found that the bacterial and fungal deterioration of sugar-cane seed pieces, which is liable to cause a heavy reduction of germination in the Philippines, is largely preventable by soaking the seed pieces for 12 hours in clear, running water. This process increased germination by nearly 15 per cent. in comparison with the untreated controls, while the number of stalks per hect. was augmented by over 33 per cent. Soaking for 24 hours proved less

satisfactory and 48 hours' immersion led to a reduction of germination as compared with the controls.

CURZI (M.). **Rapporti fra i generi Microascus Zukal e Scopulariopsis Bainier.** [The relations between the genera *Microascus* Zukal and *Scopulariopsis* Bainier.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 1, pp. 55–60, 1931.

From his studies of the perithecial stage of various species of *Scopulariopsis* Bainier [*R.A.M.*, ix, p. 410] the author concludes that Biourge's subsection *anomala* of the genus *Penicillium* [ibid., iii, p. 178] should be transferred to the former genus. There is a far wider divergence between *Penicillium* and *Scopulariopsis* than there is between the former and *Aspergillus*, since the ostiolate perithecia of *Scopulariopsis* assign the genus to the Sphaeriales, while the other two are Plectascales.

The author considers that it is not possible to maintain *Scopulariopsis* distinct from *Microascus* Zukal, in spite of the fact that the former is typically Mucedineous and the latter Dematiaceous. Some of the species of *Stysanus*, with phialid-shaped conidiophores, are also considered to be congeneric.

Those species of *Scopulariopsis* and *Stysanus* which have dark hyphae and conidia have conspicuously rostrate perithecia, while those with hyaline hyphae and conidia have non-rostrate perithecia. In both groups, however, the perithecia agree in all other respects, particularly in the formation and arrangement of the asci and the (normally abundant) ascogenous fructification.

The genera *Peristomium* Lech. and *Nephrospora* Loub. should also be regarded as synonyms of *Microascus*. The conidial stage of *Peristomium desmosporum* var. *verticillium* Lech. is of the *Scopulariopsis* type, and bears no relation to *Verticillium*.

Amongst other fungi that should be referred to *Microascus* are *Acaulium albo-nigrescens* Sopp, *A. nigrum* Sopp, *Rosellinia schumacherii* (Hans.) Sacc., and *Melanospora stysanospora* Matt.

Forty-third Annual Report of the Kentucky Agricultural Experiment Station for the year 1930.—48 pp., 1931.

In the section of this report dealing with tobacco diseases (pp. 22–24) [cf. *R.A.M.*, x, p. 85] it is stated that a white and a green cucumber mosaic, both of which produced ring-like green patterns, different from those already reported, on tobacco, are being investigated. Two strains of the white cucumber mosaic after being passed through cucumbers each produced a form of streak on tomatoes characterized by light brown necrotic areas.

White Creaseback, Striped Creaseback, and Cut Short beans [*Phaseolus vulgaris*] were inoculated with the various virus diseases of tobacco under study in Kentucky [cf. ibid., x, p. 60]. All the diseases grouped with true tobacco mosaic produced small necrotic lesions on the leaves. Of the viruses that produced disease, only ring spot [ibid., x, p. 86] gave large necrotic areas or ring-like necrotic and chlorotic patterns. Usually the new growth was killed. From these results it appears that beans may be used as a further means of identifying viruses of the true tobacco mosaic group.

A virus transferred from plantain (*Plantago major*) to tobacco produced symptoms different from those of the other tobacco virus diseases investigated. What appears to be the same virus was also obtained on at least three occasions from naturally infected tobacco.

In an attempt to obtain the veinbanding virus [loc. cit.] some 400 inoculations were made from native perennial weeds to tobacco: three of the inoculated plants were found to contain a mixture of tobacco mosaic and veinbanding, indicating that the local vegetation may harbour the latter virus.

A virus transferred by budding from Japanese plum [*Prunus japonica*] to peach produced prominent chlorotic line and ring patterns similar to those seen in tobacco ring spot; occasionally, patterns were found in the leaves of affected plum trees.

Frenching of Turkish tobacco [loc. cit.] grown in soil in the greenhouse was again found to be related to nutrient deficiency and lime supply. Frenching was not found in plants grown in soil of a P_H value of below about 6, irrespective of nutrient deficiencies. When the plants, however, were grown in soil having a P_H value of over 6, frenching was not noted except in the presence of certain nutrient deficiencies. In the latter soils it appeared to occur when there was a deficiency of nitrogen, phosphorus, or potassium.

As the selections hitherto made for resistance to black root rot (*Thielaviopsis basicola*) [ibid., viii, p. 613; x, p. 135] were not very resistant, hybridization was resorted to in an attempt to obtain more highly resistant varieties of White Burley tobacco. A variety designated No. 5 was found much more resistant in diseased plots than the widely grown 36–12 selection of Burley.

COOK (M. T.). **The leaf spot of Tobacco; an after symptom of mosaic.**—*Journ. Dept. Agric. Porto Rico*, xv, 2, pp. 183–187, 1931.

During the winter of 1929–30 the writer investigated a leaf spot of tobacco which he had first observed in Porto Rico in 1923. The spots always occurred on mature leaves, usually the lower ones; they were 2 to 5 mm. in diameter, white, brown, or black, and composed of dry, dead tissues. Careful examination of the lesions showed that they were always on the old leaves of mosaic plants, on which the symptoms either failed to develop on account of late inoculation or from which the pattern had disappeared. Plants showing no spots were observed from day to day and were found to develop spots in large numbers during the night. Following the inoculation with mosaic of plants in one part of a divided block spots appeared on the old leaves.

Cytological examination of the diseased material showed that the spots originated in the palisade cells. Many consisted of a single cell, and were invisible to the naked eye, while others ranged from small groups of a few cells to areas of 5 mm. or more in diameter. The death of the palisade cells is followed by that of those underlying them, this process usually continuing until all the cells from the upper to the lower surface are dead. Occasionally dead mesophyll cells are found in positions unrelated to the

spots. The entire cell content appears to disintegrate into a homogeneous black mass which dries and shrinks from the cell wall. The successive steps in this process are the collapse of the upper epidermis, the breaking of the cell walls throughout the affected area, contraction, and desiccation.

Attention is drawn to the similarity of these symptoms with those described by Mayer (*Landw. Versuchsstat.*, xxxii, p. 450, 1894) and others as occurring in the later stages of tobacco mosaic, some citations from the relevant literature being given.

COOK (M. T.). **Some undescribed symptoms of mosaic in Porto Rican Tobacco.**—*Journ. Dept. Agric. Porto Rico*, xv, 2, pp. 189–191, 1931.

The tobacco mosaic of Porto Rico [see preceding abstract] may be described as the common type characterized by irregular green and white areas, sometimes accompanied by inconspicuous blistering or pocketing. In very severe cases the entire plant may be pale yellow or nearly white, with small, rather brittle leaves and turned down margins. The virus responsible for tobacco mosaic is also able to produce a mosaic of tomato and pepper [*Capsicum annuum*: *R.A.M.*, x, p. 809], and when transferred back to tobacco the symptoms are the same as those on the original plant. The virus is also transmissible between tomato and pepper, the symptoms on the former being a slight reduction in the size of the leaves, mottling, and the dwarfing of some of the basal leaflets to short spurs, hardly more than a midrib.

Inoculation experiments by means of a hypodermic needle inserted at the node generally resulted in the development of mosaic symptoms in five to ten days. The typical symptoms developed on the new foliage at the top of the plant and on new shoots at any point, but were rarely observed on old leaves. On leaves that were not quite full-sized at the time of inoculation, but in which the tissues were fully differentiated, more or less circular, pale areas sometimes developed, due to the inhibition of the chloroplasts. Leaves ranging from one to two inches in length were readily inoculated by rubbing with cheese-cloth soaked in juice from a mosaic plant. In five to ten days pale spots 10 to 12 mm. in diameter appeared.

A histological study of the leaves of different ages showed (1) that when the tissues were not fully differentiated at the time of inoculation, there was an inhibition of the development of both cell structure and chloroplasts; (2) that when chlorotic areas were formed on leaves with fully developed tissues there was no change in cell structure, but the growth of the chloroplasts was inhibited; and (3) that the enlargement of the mosaic areas on young leaves is due to cell division and growth and not to an invasion of the surrounding cells by the virus.

PITTMAN (H. A.). **'Downy mildew' (so-called 'blue-mould') of Tobacco. The industry's most serious menace, and how to combat it.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., viii, 2, pp. 264–272, 3 figs., 1931.

In this paper the author points out the seriousness in Australia

of downy mildew or blue mould (*Peronospora* sp.) of tobacco [*R.A.M.*, x, p. 492]; in Western Australia, however, the disease is, in most instances, very largely a seed-bed disease, although at times it may cause very severe losses, as for instance in 1930 [ibid., x, p. 134], after the seedlings have been planted out in the fields. After a brief description of the symptoms of the disease and of the life-history of the fungus, the paper deals mainly with control measures, most of which have already been noticed [loc. cit.].

JEHLE (R. A.). **Tobacco seedbed survey in Maryland.**—*Plant Disease Reporter*, xv, 8, pp. 85–86, 1931. [Mimeographed.]

Downy mildew of tobacco (*Peronospora hyoscyami*) was found for the first time in Maryland during the summer of 1931 [*R.A.M.*, x, p. 629], twelve seed-beds being affected. Severe injury was reported in only one case, the plants apparently having suffered even after transplanting to the field. Climatic conditions in the State are generally favourable to the development of downy mildew, and the adoption of a regular spraying or dusting schedule will probably be necessary to keep it in check.

THOMAS (R. P.). **The relation of nitrate nitrogen and nitrification to the growth of Tobacco following Timothy.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 105, 28 pp., 7 figs., 1930.

The primary object of the present investigation was to examine the problem of brown root rot of tobacco [*R.A.M.*, x, p. 763] from the standpoint of soil technology.

Very low amounts of nitrate nitrogen were found during the early part of the season in all Wisconsin soils on which tobacco was subject to brown root rot (timothy [*Phleum pratense*] sod soils). In many cases abundant nitrates were found later in the season. On the other hand, plentiful amounts of nitrate nitrogen were found early in the season in soils on which tobacco grew well and was free from the disease. This shows the importance of an ample supply of nitrate nitrogen in the soil at the time when the tobacco is transplanted; once brown root rot develops the addition of nitrate nitrogen is of little value.

It was invariably found that soils producing tobacco affected by brown root rot contained a large amount of cellulose material. It was also shown that applications of cellulose, e.g., filter paper, at the rate of 2 tons per acre, to good tobacco soils resulted in a low nitrate content and poor growth combined with brown root rot. This effect could be overcome by heavy applications of easily nitrifiable materials and (where available phosphorus was deficient) of superphosphate.

The addition of lime to low and medium amounts of nitrogen and phosphorus in the poor tobacco soils produced only slight increases in the growth of tobacco in greenhouse tests, and had little or no effect on the incidence of brown root rot.

It is evident from these studies that plenty of available plant food, especially nitrogen and phosphorus, should be added to soils on which brown root rot of tobacco is prevalent. A soil to which large amounts of cellulose materials, e.g., straw and sawdust

manures and timothy sod, have been turned under, should not be put into tobacco without heavy applications of nitrate or an easily nitrifiable nitrogen and phosphate fertilizer.

There is some evidence that brown root rot of tobacco may be caused by the actual invasion of the roots by certain fungi. Possibly an abundance of energizing matter in the form of cellulose may stimulate fungous growth to such an extent that a shortage of nitrogen is created, with the result that the organisms attack the weakened roots in their search for nutriment.

HEUBERGER (J. W.) & MOYER (A. J.). **Influence of mosaic infection on Tomato yields.**—*Phytopath.*, xxi, 7, pp. 745–749, 1931.

Details are given of investigations conducted at the Maryland Agricultural Experiment Station in 1927 and 1930 to determine the effect of mosaic on the yield of Greater Baltimore and Marglobe tomatoes (the latter in 1930 only) [cf. *R.A.M.*, vii, p. 619]. In the 1927 test observations were made on the influence on the yield of the time of appearance of the symptoms in naturally infected plants, while in 1930 the plants were inoculated on four successive dates by the needle-prick method [ibid., viii, p. 138].

In both cases early infections were found to cause the heaviest reduction in yield. In 1927 the loss due to mosaic in plants showing the first symptoms on 8th July was 56·9 per cent. compared with 1·9 per cent. for those in which the disease appeared on 5th August. In 1930 the loss for plants inoculated on 26th June was 54·4 per cent., the corresponding figure for those inoculated on 3rd September being 11·2 per cent. The greater loss from late infections in the latter season is tentatively attributed to the retarded growth of the plants consequent on abnormally dry conditions.

FRICHLINGER (H. W.). **Die Streifenkrankheit der Tomaten, ein neuartiges Krankheitsbild.** [Stripe disease of Tomatoes, a new pathological picture.]—*Erfurter Führer im Obst- und Gartenbau*, xxxi, p. 395, 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxiv, 8–14, p. 328, 1931.]

Tomatoes in the Crefeld [Rhine] district of Germany have been affected for the last two years by a disease in which light to dark brown streaks, 1 to 15 cm. in length, develop on the stems, and dark brown spots appear on the leaves and fruits. The foliage is also crinkled with a tendency to shrivelling and desiccation. The causal organism of the disease, which was evidently introduced from Holland, is *Bacillus lathyri* [*R.A.M.*, x, p. 212]. Rapidly growing varieties appear to be more liable to streak disease than those maturing slowly, while infection is further favoured by liberal applications of nitrogen and by potash shortage.

HUMPHREY (C. J.) & LEUS (SIMEONA). **A partial revision of the Ganoderma applanatum group, with particular reference to its oriental variants.**—*Philipp. Journ. of Sci.*, xlv, 4, pp. 483–589, 36 pp., 1 fig., 1931.

The object of the present comprehensive investigation of the

Ganoderma applanatum group was to determine the range of structural differentiation in the variants already set up as species, with special reference to those occurring in the tropics. The results obtained by microscopic examination do not favour close segregation within the group, and the revised classification based on these studies involves a reduction of several so-called species to varieties, or their regrouping under an even broader varietal concept than that originally established for the species.

In the segregation of variants within the group only two species and four well-marked varieties are recognized, namely, *Ganoderma lobatum*, occurring in the United States and Cuba, and *G. applanatum* with its varieties *brownii*, *laevisporum* Humph. var. nov., *philippinense* var. nov., and *tornatum* Pers., with *macrospora* Humph. forma nov. as an adjunct of *tornatum*.

G. applanatum is the common temperate-zone form occurring throughout Europe and the United States, temperate South America and Africa, temperate Australia, China, Japan [see next abstract], Formosa, and occasionally at the higher altitudes in the tropics. The variety *brownii* found in California, the Canary Islands, and Java is based on the reduction of *Elfvingia brownii* Murr. to varietal rank. The variety *laevisporum*, characterized by wholly non-striate spores, occurs in Java and the Philippines; var. *philippinense*, found in the Philippines, the Federated Malay States, and Java, may be recognized by its tuberculose upper surface, the fawn-coloured streaks or bleached areas in the context, and the frequent darkening of the pore surface to mouse-grey or blackish-slate. The variety *tornatum* occurs in tropical Africa, tropical Australia, the Federated Malay States, Java, the Philippines, and Cuba; in most cases its smaller, coarsely striate spores serve to differentiate it from *G. applanatum*, but a form of this variety (*macrospora*) has spores indistinguishable from those of the type species. The spores of *G. lobatum* are intermediate between those of *G. applanatum* and the variety *brownii*.

Notes are given on the parasitism of these fungi and there is a list of the hosts hitherto recorded.

YAMANO (Y.). **On the morphology and physiology of Fomes applanatus (Fr.) Gill. and its allies.**—*Sci. Repts. Tôhoku Imper. Univ.*, Ser. iv (*Biol.*), vi, 2, pp. 199–236, 4 pl., 1 graph, 1931.

A full description, supplemented by 29 tables, is given of the writer's studies on the forms referred to *Fomes applanatus* [*Ganoderma applanatum*: see preceding abstract] and related species in Japan. Two species are recognized, viz., *F. applanatus* and *F. vegetus*. The latter [regarded by Humphrey (loc. cit.) as only a form of *G. applanatum*] differs from *F. applanatus* in the context tissue layer interposed between the tube layers. The mature spores are ferruginous, warty, obovate, becoming truncate at the base, and measure $7{\cdot}80 \pm 0{\cdot}024$ by $5{\cdot}34 \pm 0{\cdot}019\ \mu$. The spores of *F. applanatus* measure $9{\cdot}09 \pm 0{\cdot}03$ by $5{\cdot}88 \pm 0{\cdot}025\ \mu$. The hosts of *F. applanatus* in Japan include *Abies sachalinensis*, *Acer pictum*, *Diospyros kaki*, *Prunus mume*, *Quercus stenophylla*, and *Ligustrum ovalifolium*, while among those of *F. vegetus* may be

mentioned *A. pictum, Betula japonica, Fagus japonica, Q. grosseserrata, Salix urbaniana,* and *Tilia japonica.* A variety *leucostratus* of *F. vegetus,* found on dead trunks of *Q. grosseserrata,* is also described.

VAN VLIET (J. I.). **Esschenkankers en hun bouw.** [Ash cankers and their structure.]—*Thesis, Univ. of Utrecht,* 73 pp., 1 pl., 24 figs., Baarn, Hollandia-Drukkerij. 1931. [German summary.]

From a survey of the relevant literature, as well as from the writer's examination of material from various parts of Holland, the Swiss Jura, and Scotland, it would appear that ash (*Fraxinus excelsior*) cankers are of two types, one being of bacterial origin as described by Noack (*Zeitschr. für Pflanzenkrankh.*, iii, p. 193, 1893) and possibly including those attributed by subsequent workers to *Pseudomonas savastanoi* [*R.A.M.*, ii, p. 12], and the other due to *Nectria galligena* var. *major* [ibid., vii, p. 677].

Bacterial cankers are of three forms, viz., verrucose, depressed, and intermediate between these two types. The verrucose cankers assume the form of large or small protuberances the entire surface of which is covered with warts. The depressed cankers are holes in the wood surrounded by a jagged edge of bark; they are of varying depth, mostly circular, but occasionally much elongated. The transitional forms include, on the one hand, depressed cankers with verrucose edges, and on the other, sunken areas with a marked tendency to healing over.

The *Nectria* cankers originate as sunken areas, which heal over and develop a verrucose surface resembling that of the abovementioned verrucose type. The perithecia of *N. galligena* var. *major* are often found on the *Nectria* cankers. These are stated to be confined to the trunks of young trees, whereas the bacterial cankers occur on the branches as well. The protuberant and depressed bacterial cankers are never found together on the same tree.

In the verrucose bacterial cankers the diseased bark is composed chiefly of brown canker tissue, within which only a narrow strip is healthy. In those of the depressed type the canker tissue is restricted to the inner cortical layers of the edge of the canker. The diseased tissue contains many cork layers running approximately parallel to the cambium and often visible to the naked eye as pale lines. Between the cork layers are cavities filled with bacterial slime and sometimes containing hyphae, while they may also be occupied by a mass of needle crystals, probably calcium oxalate.

Below the canker tissue the structure of the cortex becomes more parenchymatous, the sclerenchyma sometimes disappearing altogether. The intercellular spaces of the cortical strips immediately inside the youngest cork layer are mostly filled completely or partially with a yellow substance, bacteria being also frequently present. The unequal development of cork in the cells adjoining the intercellular spaces causes tension in the tissues which rupture in various places. This mechanical explanation of the origin of the bacterial cavities is believed to be in accordance with all the

observed facts. The much swollen wood below the proliferating cortex is brownish and dull, the annual rings being separated from one another by a brown line. Where the cambium is killed by the parasite, healing over takes place. The wound, however, does not always close completely, so that radial fissures may develop which enlarge with the canker. Noack's observation of the penetration of the wood by the bacterium was not confirmed by the writer.

The *Nectria* cankers are conspicuous by the reddish-brown coloration of the diseased cortex, which may possibly be correlated with the high tannin content of the cells. Sometimes cavities filled with hyphae were found in the cortex, on which perithecia developed superficially. The wood vessels underlying the diseased bark also contained hyaline hyphae.

The *Nectria* canker is a true canker in Appel's and Miss Westerdijk's sense of the term (*Zeitschr. für Pflanzenkrankh.*, xxix, p. 176, 1919). In the case of the bacterial disease some doubt may be felt as to the applicability of the word 'canker'. Periodic healing over occurs, however, in this type also, the great differences between the verrucose and the depressed cankers being apparently due to variations in the intensity of this process. It seems, therefore, permissible to describe the bacterial disease as a canker in the strict sense of the word.

Garbers (F.). **Das rätselhafte grosse Ulmensterben. Welche Massnahmen gegen das Ulmensterben?** [The mysterious widespread die-back of Elms. What measures should be taken against the die-back?]—*Gartenwelt*, xxxv, 9, pp. 113–114, 1931.

Commenting on Brill's proposal that elms in Germany should be drastically cut back in order to detect the typical discoloration due to *Graphium ulmi* [*R.A.M.*, x, p. 348], the writer points out that freshly sectioned wood is liable to assume, within 30 minutes after cutting, a brown tinge which is much prized for graining purposes. This type of discoloration does not necessarily imply infection by *G. ulmi*, which is characterized by comma-shaped streaks or circles in the youngest wood. The writer advocates the compulsory eradication of infected trees in order to save the healthy residue [ibid., x, p. 752]. As early as 1923 it was ascertained that 10 per cent. of the Bremen elm stand were diseased and 469 trees were immediately felled. At this time there was scarcely a trace of die-back in Hamburg, while Saxony also remained free from infection considerably longer than north-west Germany and Bavaria.

Hürländer (L.). **Frühfrost die Ursache des Ulmensterbens?** [Early frost the cause of the die-back of Elms?]—*Gartenwelt*, xxxv, 9, p. 114, 1 fig., 1931.

About 20th October, 1919, there was a heavy snowfall in the Altenberge district of Münster [Westphalia], followed by a very sharp frost which lasted for a week. At this time the first symptoms of the elm disease which ultimately developed into die-back were observed, suggesting that infection by the causal

organism (*Graphium ulmi*) is favoured by severe cold. Trees in damp sites where the roots were surrounded by surface water were particularly affected. It was found that diseased elm scions did not transmit infection to the healthy stocks on which they were grafted. The recent proposal for the drastic cutting back of elms for the purpose of examination [see preceding abstract] is deprecated as likely to provide a ready means of access to the parasite through the cut surfaces [but see *R.A.M.*, x, p. 695].

BRILL (O.). **Neue Beobachtungen über die Schuld des Ulmensplintkäfers.** [New observations on the complicity of the Elm sap beetle.]—*Gartenwelt*, xxxv, 9, pp. 114–115, 1931.

The writer recently examined branches cut from a stand of 200 elm (*Ulmus montana*) trees near Berlin which during the summer of 1930 showed little or no external symptoms of infection by *Graphium ulmi* [see preceding abstracts], although one-third of the total stand was afterwards found to be diseased. The feeding tracts of the elm sap beetle [*Scolytus scolytus*: *R.A.M.*, x, p. 565] were barely discernible owing to their overgrowth by the sapwood, but the work of the insects was recognizable by the small, pale, brittle areas in the medullary rays. It was further observed that there was scarcely any trace of flower buds in diseased branches of the upper parts of the crowns, apparently owing to the disturbance of the sap circulation by the excretions of the fungus. From about the beginning of January onwards this characteristic may be used to differentiate diseased from healthy elms.

ATWELL (E. A.). **Occurrence of Cadophora fastigiata in Canada.** —*Phytopath.*, xxi, 7, p. 761, 1931.

Cadophora fastigiata [*R.A.M.*, ix, p. 77] has recently been isolated by the writer from stained sapwood obtained in Canada from white spruce (*Picea canadensis*), white pine (*Pinus strobus*), jack pine (*P. banksiana*), and Douglas fir (*Pseudotsuga taxifolia*). When grown in pure culture on sapwood blocks of *P. strobus* and red pine (*P. resinosa*), the fungus produced an intense grey-green stain. An unnamed fungus reported by Kress and his co-workers [ibid., iv, p. 644] as causing a grey spotting of ground wood in the United States is considered to be the same species.

TAMURA (T.). **New methods of test on the toxicity and preservation value of wood preservatives.**—*Phytopath. Zeitschr.*, iii, 4, pp. 421–437, 2 figs., 1 diag., 1931.

An improved method of testing the toxicity of certain preservatives to wood-destroying fungi is described, and the results of experiments to determine its efficacy are tabulated and discussed [cf. *R.A.M.*, viii, p. 618; x, p. 357].

Culture bottles of the Kolle flask type are used, the mouths being plugged with cotton. The following preservatives were tested: creosote oil grade 1 (Tokyo Gas Co.), semi-low-temperature tar (Yokohoma Gas Bureau), basilite, malenite, triolith, and aczol [ibid., vi, p. 707 *et passim*]. The woods used were *Fagus sieboldi* and *Pinus densiflora*, test pieces of which (some impregnated with one or other of the above-mentioned preservatives at varying con-

centrations and others untreated) were laid on pure cultures of *Polystictus sanguineus, Schizophyllum commune* (*F. sieboldi* and *Pinus densiflora*), and *Poria vaporaria* (*Pinus densiflora*) on soy agar at 27° C. [ibid., x, pp. 71, 572]. The most suitable solvents were found to be ether or ether-alcohol for the creosote oil and semi-low-temperature tar, and distilled water for the other preservatives.

At the end of five weeks the relative efficacy of the preservatives was estimated by determining the degree of nutrient poisoning, respiration poisoning, and after-penetration. It was found that the toxicity of creosote oil (100 per cent.) was about 1 to 5 times as great as that of low-temperature tar (100 per cent.), and 1·5 to 20 and 1·9 to 17 times as great as that of basilite (the best of the other preservatives) for A (toxic limit due to the combined effects of the nutrient and respiration poisons) and B (toxic limit due to the combined effects of respiration poison and after-penetration), respectively.

In a supplementary test, blocks of treated wood were exposed to the combined effects of weathering and fungous infection for varying periods up to eight months. The woods used were *P. densiflora, Larix leptolepis, Kalapanax ricinifolius*, and *F. sieboldi*, the two former being laid on cultures of *Poria vaporaria* and the two latter on those of *Polystictus sanguineus*. It was found that basilite and malenite failed to protect the wood against infection during a month's weathering, whereas creosote oil exerted a high degree of toxicity even after eight months.

Dreifuss (M.) & Staab (A.). **Über eine Methode zur exakten qualitativen und quantitativen Bestimmung der Eindringungstiefe von Quecksilberchlorid bei der Kyanisierung von Rundhölzern.** [On a method for the accurate qualitative and quantitative determination of the depth of penetration of mercuric chloride in the kyanization of round timbers.]—*Chem. Zeit.*, lv, 52, pp. 497–498, 1 fig., 1931.

The method in current use for the determination of the depth of penetration of mercuric chloride in softwoods impregnated by the kyanization process [*R.A.M.*, v, p. 11 *et passim*] having proved unreliable, the writers devised a method involving the quantitative estimation of the mercury carried over in one hour's dry distillation of the treated wood. Very minute amounts of mercury can be determined by this method in the deeper wood layers.

Schwalbe (C. G.). **Über eine Methode zur exakten qualitativen und quantitativen Bestimmung der Eindringungstiefe von Quecksilberchlorid bei der Kyanisierung von Rundhölzern.** [On a method for the accurate qualitative and quantitative determination of the depth of penetration of mercuric chloride in the kyanization of round timbers.]—*Chem. Zeit.*, lv, 65, p. 628, 1931.

Referring to the method devised by Dreifuss and Staab for the determination of mercuric chloride in kyanized wood [see preceding abstract], the writer states that during the distillation process a certain proportion of the mercury finds its way into the

coal-tar, from which it cannot be separated by the usual means. The mercury content of the wood can be more accurately determined by the partial disintegration of the latter (lignin fraction) with dilute nitric acid. In the course of this process all the mercury passes into the nitric acid solution, where it can be determined in the ordinary way.

Replying to this criticism, Dreifuss and Staab state that no mercury could be detected, by gross analytical methods, in the burnt charcoal after distillation. Possibly an excessively minute amount might be discoverable by microanalysis, but this is regarded as immaterial. No loss of mercuric chloride through union with coal-tar during dry distillation was observed in the writers' tests, even in the case of ten-year-old timber.

Honig (F.). **Der Kohlkropferreger (Plasmodiophora brassicae Wor.). Eine Monographie.** [The causal organism of finger-and-toe disease (*Plasmodiophora brassicae* Wor.). A monograph.]—*Gartenbauwissensch.*, v, 2–3, pp. 116–225, 9 figs., 2 maps, 1931.

A comprehensive account is given of the author's original observations on the etiology of finger-and-toe disease of crucifers (*Plasmodiophora brassicae*) in Germany, together with a critical survey of the literature on the subject from the earliest records to the present day.

The average diameter of the spores of the fungus from a number of different hosts, including several kinds of cabbage, radish, and cauliflower, was $3{\cdot}9\,\mu$. The body liberated from the spore is regarded as a true amoeba [*R.A.M.*, viii, p. 4; x, p. 3] and not as a zoospore. The amoeba is devoid of cilia, and has no pulsating vacuole. The spores were found to germinate equally well in alkaline and acid solutions, germination occurring below 21° C. and in the absence of seedlings. The penetration of the root hairs by living amoeba is stated to have been observed for the first time. Larger amoebae were shown to penetrate as readily as small ones, the tip of the root hair evidently being preferred for this purpose. The capacity of the amoebae for saprophytic nutrition is presumably the cause of the increased infection following the application of organic manures. For the first time the amoebae were kept alive for several months outside the host.

A new host of *P. brassicae* was detected, viz., *Raphanus oleiferus*.

The existence of biologic strains of the finger-and-toe organism is stated to be apparently proved by the author's cross-inoculations. The strain from kohlrabi (*Brassica oleracea* [var.] *gongylodes*) is readily transmissible to kohlrabi, cauliflower, rape (*B. napus* [var.] *oleracea*), turnip, and *Camelina sativa*, while it can only be transferred with difficulty to radishes (*R. sativus* and *R. oleiferus*). The cauliflower strain was found to be completely identical with that from kohlrabi, but the strains from radish and Savoy cabbage (*B. oleracea* [var.] *sabauda*) are evidently distinct.

The application of a physiologically acid complete fertilizer resulted in an increase of infection up to 100 per cent., while a physiologically alkaline one reduced the incidence of the disease but failed to prevent it entirely.

Holmes-Smith (E.). **Control of club-root and root maggot of Brassicae.**—*Gard. Chron.*, xc, 2324, pp. 35–36, 5 figs. (3 on pp. 32, 33, 34), 1931.

The writer again reports excellent results in the combined control of club-root [*Plasmodiophora brassicae*] and root maggot (*Chortophila brassicae*) of cabbage and Autumn Giant cauliflowers in Lancashire and Cheshire by the application to the soil of corrosive sublimate 1 in 2,000 [*R.A.M.*, ix, p. 755]. Independent testimony to the efficacy of the treatment has also been received from growers in England, Scotland, and Ireland.

Jones (L. K.). **Treatment of Pea seed with chemical materials**—*New York (Geneva) Agric. Exper. Stat. Circ.* 118, 3 pp., 1931. [Abs. in *Chem. Abstracts,* xxv, 17, p. 4651, 1931.]

The writer's experiments have shown that the immersion of pea seed in liquid disinfectants tends to reduce the percentage of germination and stand [*R.A.M.*, x, p. 576]. Dust treatments were as effective against foot rot (*Ascochyta pinodella*) [ibid., x, p. 586] and basal stem rot (*Mycosphaerella pinodes*) as the liquid preparations. Of the dusts tested, semesan (3 oz. per bushel of seed) proved the most efficacious.

Togashi (K.). **Cardinal temperatures of Pea-wilt Fusaria in culture.**—*Japanese Journ. of Botany,* v, 4, pp. 385–400, 1 graph, 1931.

The author discusses and tabulates the results of his studies on the temperature relations of three species of *Fusarium* previously found to be associated with pea wilt in Japan, viz., *F. arthrosporioides*, *F. sporotrichioides*, and *F. anguioides* [*R.A.M.*, viii, p. 213], in comparison with those of *F. martii* var. *minus* and a number of other species [which are listed].

Of all the species investigated, *F. martii* var. *minus* was found to be the most thermophilic, with a mycelial growth range of 5° to over 35° C. (optimum 18° to 33°), the corresponding figures for sporulation being 10° to 35° (13° to 25°). *F. sporotrichioides* made vegetative growth from below 3° to over 33°, the optimum range for mycelial development being 18° to 30° and for sporulation 18° to 28°. In the case of *F. anguioides* mycelial growth occurred between 3° and 33°, with an optimum at 15° to 28°. The mycelium of *F. arthrosporioides* grew between 3° and more than 33°, with an optimum from 15° to 25°. Sporulation did not occur in this species. The minima for the pea wilt organisms are lower than those of any of the other *Fusarium* species studied except *Gibberella saubinetii* (*F. graminearum*) and *F. oxysporum* var. *medicaginis* (3° and below 3°, respectively). Generally speaking, the maxima of the pea wilt species of *Fusarium* were also lower than those of the others.

Lacey (Margaret S.). **Studies in bacteriosis. XIX. Researches on the group of green-fluorescent bacteria, part I; Bacterium trifoliorum (Jones et al.) as the cause of a disease of Vicia faba.**—*Ann. of Appl. Biol.*, xviii, 2, pp. 180–186, 1 pl., 1931.

The author states that isolations from broad bean (*Vicia faba*)

plants severely affected with a bacterial rot of the stems and apical buds, and a severe leaf spotting, yielded an organism which cultural and inoculation tests showed to be identical with *Bacterium trifoliorum* [*R.A.M.*, viii, p. 176]. It is a short, aerobic, Gram-negative, non-sporulating rod with one to six polar flagella; it does not liquefy gelatine, produce indol, or reduce nitrates, and its diastatic action is weak or absent. It forms acid from dextrose, galactose, and (feebly) from saccharose, but none from lactose, mannite, maltose, dulcite, sorbite, inulin, or raffinose. Its optimum temperature for growth is 30° C. with a maximum at 37°. It grows well in Fermi's and Uschinsky's solutions, with formation of a thick mucoid yellow pellicle, and with a yellowish-green fluorescence; the latter is also produced in gelatine media, but not in bouillon or beef-extract agar, on which it forms yellowish-white colonies, the thickest part of which in old cultures frequently becomes yellow or even brown. Each type of colony can give rise to the others in replating, and all were identical in respect of virulence and cultural reactions.

Further tests showed that the organism is culturally very similar to five other bacterial pathogens, all non-liquefiers of gelatine, namely, *Bact. glycineum* [ibid., v, p. 723], *Bact. medicaginis* [ibid., ix, p. 187], *Bact. medicaginis* var. *phaseolicola* [ibid., x, p. 357], *Bact. nectarophilum* (the cause of pear blossom blight in South Africa), and *Bact. lacrymans* [ibid., x, p. 287]. In addition to these plant pathogens, two saprophytic species, namely, *Bact.* [*Bacillus*] *fluorescens non-liquefaciens* and *Bact.* [*B.*] *striata* (found in soil), also show close cultural agreement with *Bact. trifoliorum*, but inoculations of broad beans with these two organisms invariably gave negative results. The resemblance of these saprophytic strains to the pathogenic strains is, however, so marked as to raise once again the question, suggested by various authors, whether all the pathogens of the green fluorescent group are not parasitic strains of *Bact.* [*B.*] *fluorescens liquefaciens* or *B. fluorescens non-liquefaciens*.

LEHMAN (S. G.). **Observations and experiments relating to the bacterial pustule disease of Soybean.**—*Journ. Elisha Mitchell Sci. Soc.*, xlvi, 2, pp. 179–189, 1931.

Bacterium phaseoli [var.] *sojense*, the causal organism of the bacterial pustule disease of soy-beans [*R.A.M.*, ix, pp. 289, 359], was isolated at the North Carolina Agricultural Experiment Station from lesions on the Tar Heel Black variety showing no sign of pustular development. It is believed that intumescence, though frequently present, is not a necessary concomitant of infection by *Bact. phaseoli* var. *sojense*, and that the absence of pustules from lesions does not prove the latter to be due to some other cause. On the Mammoth Brown variety, however, the pustulate lesions greatly exceeded the non-pustulate, and the latter type did not occur on any of the other varieties examined.

The results [which are discussed and tabulated] of inoculation experiments on the Biloxi variety showed that infection was heavier on plants kept at a uniform temperature of 30° to 33° C. than on those exposed to fluctuations between 22° and 30°. Very

few lesions developed on inoculated plants when the air temperature ranged from 15° at night to 25° during the hottest part of the day. Tests on the Herman variety showed that susceptibility to the bacterial pustule disease diminishes rapidly with increasing maturity of the leaf.

Bact. phaseoli var. *sojense* was found to be viable for at least three months in decaying leaves and for nine months in dry ones, thus giving ample time for the perpetuation of the disease from one season to the next.

LEHMAN (S. G.). **Powdery mildew of Soybean.**—*Journ. Elisha Mitchell Sci. Soc.*, xlvi, 2, pp. 190–195, 3 figs., 1931.

In January, 1928, seedling soy-bean plants in a greenhouse at the North Carolina Agricultural Experiment Station were observed to be affected by a powdery mildew which produced a dull grey spotting of the upper sides of the leaflets and a pale pink to deep vinaceous colouring of the tissues, the latter symptom being most conspicuous on the lower surfaces. A similar type of mildew had been present for some weeks on garden beans [*Phaseolus vulgaris*] on the opposite side of the greenhouse in a much more severe form, and is believed to have spread from these plants to the soy-beans.

The conidia from both hosts showed a similarity of form (elliptical with flattened ends). The measurements of 52 conidia from beans gave a range of 26 to 52 by 16 to 23 μ with a mean of 36·5 by 19·4 μ; the number of turgid conidia from soy-beans was insufficient for comparison, but they appeared to be approximately similar. Inoculation experiments with conidial suspensions of the fungus from garden beans (identified as *Erysiphe polygoni*) on the same host and soy-beans gave positive results only in the former case, presumably owing to the existence of physiologic strains within the causal organism [*R.A.M.*, vi, p. 511]. There is considered to be no doubt that the conidia found on the Morse soy-beans were those of *E. polygoni*, the only previous record of which on this host in the United States appears to be from North Carolina in 1921.

WERNECK (H. L.). **Neue Wege zur Bekämpfung der Blattflecken-krankheit der Zuckerrübe.** [New methods in control of the leaf spot disease of the Sugar Beet.]—*Fortschr. der Landw.*, vi, 14, pp. 454–456, 1931.

In 1929 the sugar beet crops of Upper Austria were severely attacked by leaf spot (*Cercospora beticola*), which caused losses of 15 to 40 per cent. in localities up to 450 m. above sea level [*R.A.M.*, ix, p. 576]. It was found that the disease occurred in all those fields receiving their full measure of stable manure and synthetic fertilizers in one dose in the spring, while it was practically absent from those to which nitrogen was applied (especially in the form of liquid manure) at the second hoeing from 15th June to 1st July. The incidence of infection was also low among beet crops following clover. It would seem that a deficiency of nitrogen during the cool, wet weather normally associated with the critical period for infection (latter part of June and early days of July) lowers the resistance of the plants to the

fungus, which reaches its optimum development at this time. In 1930, when the whole month of June was hot and dry in the region under discussion (along the Danube from Passau to Pressburg), the incidence of leaf spot was negligible. In normal seasons a further application of liquid manure at or immediately after the second hoeing is likely to prove beneficial.

Attention is drawn to the work of Chrzanowsky (*Landw. Versuchsw.*, (Warsaw), iii, 3 and 4, 1927) on leaf spot of beets in Poland, a German summary of which appeared in *Pflanzenbau*, vi, [p. 348], 1930. This investigator also found a reduced amount of infection among beet crops following clovers and lupins, and suggested that this was possibly on account of the action of the nitrogen and the increased porosity of the soil. He also got excellent results by the application of one-third of the normal nitrogen allowance, in the form of saltpetre, during the period from 25th July to 15th August.

CURZI (M.). **Intorno alle infezioni cercosporiche dell' 'Arachis hypogea' L.** [On *Cercospora* infections of *Arachis hypogea* L.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 1, pp. 84-97, 8 figs., 1931.

After briefly reviewing some of the recent literature dealing with *Cercospora* infection of groundnuts and fully describing his own observations on the morphology of *C. personata* [*R.A.M.*, vi, p. 398 *et passim*] on groundnut leaves received from Italian Somaliland, the author states that up to the present this is the only species of *Cercospora* definitely known as parasitizing this host, and in all probability various strains exist which differ morphologically as well as in their parasitism. *Septogloeum arachidis* Rac. (1898) and *C. arachidis* P. Henn. (1902) agree in their main characters with *C. personata* and should be regarded as synonymous with it. *C. arachidis* var. *macrospora* Maff. [ibid., ii, p. 174] should remain a distinct variety of *C. personata* until their systematic relationship has been definitely ascertained.

A bibliography of 26 titles is appended.

STANER (P.). **Mosaïque des feuilles de Manioc.** [Mosaic of Cassava leaves.]—*Bull. Agric. Congo Belge*, xxii, 1, pp. 75-80, 2 figs., 1 plan, 1931.

After briefly describing the symptoms of mosaic disease of cassava [*R.A.M.*, x, p. 639] in the Belgian Congo the author gives an account of inoculation experiments in which cuttings from healthy and mosaic plants were set in proximity to one another, some under insect-proof cages, and the plants which grew from the healthy cuttings inoculated with the filtered and unfiltered juice expressed from the leaves of mosaic cassava plants; the inoculations were made by rubbing, in the stalk, leaf petioles, and leaves. Insects of various [named] species taken from diseased cassava were placed on the leaves of the plants in one cage. All the inoculations gave negative results. The author concludes that this disease of cassava is probably due to a bacterium. It is pointed out that healthy and diseased shoots are frequently noted

growing from one and the same tuber, an indication that the disease is localized.

Petri (L.). **Sull' 'arriciamento' della Vite.** [On leaf roll of the Vine.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 1, pp. 61–83, 1 pl., 11 figs., 1931.

After describing in detail the characters shown by the hypertrophied cells of the apical meristem of the young roots of Rupestris du Lot vines affected with leaf roll [*R.A.M.*, ix, pp. 83, 761], resulting in club-shaped swellings of their tips, the author states that no confirmation has hitherto been obtained of the probable relation which exists between the intracellular bodies, somewhat resembling plasmodia, which he described in 1918 (*Rendic. R. Accad. Lincei, Cl. Fis., Mat. e Nat.*, xxvii, p. 271) and which finally fill the hypertrophied, generally plurinucleate, cells of the swellings, and the vacuolate bodies present in the cambial cells of other parts of the plant, near the nuclei. Further evidence was obtained of the close analogy existing between the vacuolate bodies and the 'X' bodies found in plants affected with virus diseases [ibid., ix, p. 539]. The presence of the intracellular cordons [ibid., ix, p. 83] is still regarded as diagnostic, and has been noted also in vines affected by court-noué which the author had examined from France.

The author considers that leaf roll is certainly infectious and that it has been fully demonstrated that the disease is soil-borne and also transmissible by contact between diseased and healthy roots. It is probably caused by a virus, whose ultramicroscopic, filterable stage is present in the cambium, and whose reproductive, microscopically visible stage develops in the root tips.

Piguet (G. A.). **Contribution à l'étude des vins de Raisins grêlés et coîtrés.** [Contribution to the study of wines made from Grapes attacked by hail and 'coître'.]—*Ann. Agric. de la Suisse,* xxxii, 2, pp. 155–166, 1931.

Some general observations, supplemented by experimental and analytical data, are made in connexion with the deleterious effects of the hail disease or 'coître' of vines (*Coniothyrium diplodiella*) on the flavour and keeping quality of the wines made from affected grapes in the canton of Vaud (Switzerland) [*R.A.M.*, x, p. 157]. Suggestions are further made for the avoidance of these defects by various precautions in the vinification processes.

Wormald (H.). **Notes on plant diseases in 1928–1930.**—*Ann. Rept. East Malling Res. Stat., 1928, 1929 and 1930, II supplement,* pp. 123–132, 1931.

This account of plant diseases observed at East Malling Research Station, Kent, or received from growers, in 1928 to 1930, contains the following items of phytopathological interest besides those already noted from other sources [*R.A.M.*, viii, p. 545 ; x, pp. 158, 250, 322, 358].

Sooty blotch of apples, closely resembling the disease caused by *Gloeodes pomigena* in America [ibid., viii, p. 154; x, p. 801] was very prevalent in 1927 and 1930, but was apparently checked by

the dry summers of 1928 and 1929. The commonest type of disfigurement consisted of blotches about one quarter of an inch in diameter, sometimes coalescing into large, well-defined, almost circular patches, and studded with minute black dots consisting of an aggregation of fungal cells. In September, 1930, a similar form of sooty blotch was observed on Warwickshire Drooper and Cambridge Gage plums, this being apparently the first record of the disease on this host.

A leaf spot of *Yucca,* in which some of the spots showed concentric markings and the larger ones bore the fructifications of *Coniothyrium concentricum* [ibid., ix, p. 204], was observed in an East Malling garden. Young *Thuja lobbi* trees at East Malling were affected by the leaf spot due to *Keithia* [*Didymascella*] *thujina* [ibid., vii, p. 59].

In 1929 lesions containing bacteria were observed on the flowers and spurs of pear trees soon after blossoming, the symptoms of the disease resembling those caused at Long Ashton by *Bacillus barkeri* [ibid., iv, p. 469; v, p. 470]. An organism was isolated from the diseased material, which, when inoculated into young pear fruits, caused blackened lesions, though similar inoculations on pear flowers gave negative results. The organism, the identity of which has not yet been established, can be distinguished from *B. barkeri* by certain cultural characters; it is more nearly related to *Pseudomonas prunicola* [see below, p. 58], which causes a bacterial wilt of plum shoots.

During the first week of July, 1929, cherries showing blackened lesions swarming with bacteria were received from Newington. An organism was isolated from the spots, and this, when inoculated into cherries in the laboratory, produced lesions; in 1930, cherry fruits growing in the open were also inoculated and the results were again positive. This organism also appears to be closely related to *P. prunicola.*

Pathologie végétale. [Plant pathology.]—*Rapport sur le fonctionnement de l'Inst. des Recherches Agron. pendant l'année 1930*, ix, pp. 411–445, 1931.

This report contains, among numerous others, the following items of phytopathological interest other than those already noticed from different sources. Studies at Grignon of the effect of wheat bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, x, p. 303] on the development of artificially infected Bon Fermier plants demonstrated that the length of the bunted shoots to the base of the ears averaged 10 per cent. shorter than the healthy ones. That the fungus was still viable in the base of the culms at the time of spore production was shown by the fact that suckers developed during damp weather after ear formation on lodged plants bore affected ears.

Puccinia glumarum was noted on cereals on 24th January, 1930, at Versailles, on 14th February at Grignon, and during the winter at Clermont-Ferrand; *P. triticina* was observed on cereals on 14th February at Grignon and during the winter at Clermont-Ferrand. The relative susceptibility to these rusts of a number of the wheat varieties grown at Clermont-Ferrand is indicated. In

none of these localities were any pustules of *P. graminis* observed on cereals during the winter of 1929–30.

The Imperia variety of potatoes, imported from Sweden, and considered to be resistant to leaf roll [ibid. vii, p. 596], had remained free from this disease during the four years that it had been grown at Grignon, but became contaminated in 1928 through proximity to diseased potato plants. A study of the progeny of diseased plants showed reductions in yield of 14 and 44 per cent. for 1929 and 1930, respectively.

In Alsace and one other locality in France a disease of tobacco characterized by the presence of a brown canker on the main stem was observed; in advanced stages of the disease (seen only in the department of Bas-Rhin) the plants wilted. A thick, intercellular, varicose mycelium was present in the affected tissues, and on isolation the fungus was determined as *Phytophthora parasitica* var. *macrospora* [ibid., vii, p. 601; see also viii, p. 674].

Hops previously attacked by *Gibberella saubinetii* [ibid., viii, p. 264] became freed from infection when transplanted into well tilled soil in the hop-garden, where they grew vigorously. In this particular instance, the hops appear to have become infected largely as a result of weakness.

Investigations conducted since 1927 into die-back of apricot trees in the Rhone valley [ibid., viii, p. 656; ix, pp. 255, 465; x, p. 529] indicated that necrosis of the wood is frequently an important concomitant of this condition. Numerous observations made in 1930, mostly on trees four to twelve years old, showed that these lesions were present on nearly all parts of the trees, affecting one or more of the younger annual rings. A tree may be infected from the roots to the twigs, or even to the petioles. Isolations from the lesions in the wood showed the presence of *Verticillium dahliae* in proportions up to 85 per cent. In many cases, however, the organisms present included bacteria and species of *Fusarium*, *Coryneum*, and *Alternaria*, infection by which was always traceable to a wound and, unlike the *V. dahliae* infections, was restricted to only a part of the tree. Die-back of peaches in the Rhone valley [ibid., viii, p. 180] was also associated with lesions in the wood. Isolations from affected parts gave organisms closely resembling or identical with those found in apricots affected with the same condition. A particularly important part in the causation of the disease in peaches, however, appears to be played by *Polyporus* [*Fomes*] *fulvus* [ibid., ix, p. 188] the sporophores of which were very frequently found on peach trees subjected to severe pruning.

Hysterangium boudieri, a rare fungus in the Alpes Maritimes, was found to pass through the first stages of its life-cycle as a parasite on the roots of *Iris unguicularis* and narcissus. This is stated to be the first occasion that the parasitism of a species of this group of fungi has been definitely established.

Infection tests with *Phyllosticta rabiei*, the causal organism of anthracnose of chick peas (*Cicer arietinum*) [ibid., ix, p. 697], on 36 types of the host from northern Africa and the south of France resulted in two pure lines of *C. arietinum* var. *album* and one of *C. arietinum* var. *nigrum* being found completely resistant.

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1930.** [Annual report for 1930 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Ann. Agric. de la Suisse*, xxxii, 3, pp. 273–310, 3 graphs, 1931.

In addition to various other items of phytopathological interest in connexion with vines and fruit trees [cf. *R.A.M.*, x, p. 10], the following may be mentioned. The conditions for the development of downy mildew of the vine (*Peronospora* [*Plasmopara*] *viticola*) were more favourable during the wet summer of 1930 than for many years past. Good control of the disease was uniformly obtained by eight applications of Bordeaux mixture supplemented by two of a copper or sulphur dust [ibid., x, p. 9]; the exclusive use of dusts cannot be recommended under the climatic conditions prevailing in the canton of Vaud. Skim milk, casein, or some other standard spreader should be added to the Bordeaux mixture.

The causal organism of coître (*Coniothyrium diplodiella*) [see above, p. 21] was found to retain its germinative capacity and virulence for at least ten years.

Attacks of root rot (*Rosellinia necatrix*) occurred on vines [ibid., ix, p. 360] during the period under review.

Septoria gladioli [ibid., x, p. 645] was found on gladioli, this being the first record of the fungus for Switzerland.

LEPIK (E.). **Fütopatoloogilised märkmed 2–8.** [Phytopathological notes 2–8].—*Mitt. Phytopath. Versuchsstat. Univ. Tartu (Esthonia)* 7, 14 pp., 8 figs., 1931. [German summary.]

During the period from 1925 to 1929, gooseberry rust (*Puccinia ribes-caricis*) occurred in a very destructive form in Esthonia, generally affecting up to 50 per cent. of the crop, and in extreme cases rendering all the fruit unfit for consumption [cf. *R.A.M.*, vii, p. 618]. In order to determine whether the mycelium is capable of overwintering in the young twigs or buds, one series of branches was isolated in glass cylinders before the unfolding of the leaves, while another lot was planted out under specially constructed glass vessels. All the isolated branches remained free from rust, which severely attacked the adjacent non-isolated ones. It would appear, therefore, that the mycelium of *P. ribes-caricis* does not overwinter in the bushes. The American mountain gooseberry (*Ribes montana*) was found to be immune from rust, whereas all the European varieties derived from *R. grossularia* are very susceptible. Among the resistant varieties tested at Dorpat in 1930 were Houghton, Seedling, Pearl, and Duke, while Green Willow, Columbus, Prince of Orange, Crown Prince, and others were very susceptible.

Neither powdery scab (*Spongospora subterranea*) nor wart disease (*Synchytrium endobioticum*) of potatoes has yet been found in the country, and legal measures are in force to prevent their introduction.

In 1930 the first aecidia of *P. graminis* were observed at Dorpat on 17th May on *Berberis vulgaris*, *B. thunbergii* remaining free from infection.

The excessively mild winter of 1929–30 greatly favoured the

development and spread of clover canker (*Sclerotinia trifoliorum*) [ibid., x, p. 669], which caused 10 to 60 or even up to 90 per cent. injury to the crops. *Epichloe typhina* [ibid., viii, p. 314] occurred in epidemic form on meadow grasses in the north of the country.

Flax was attacked by *Phoma exigua* [ibid., ix, p. 246] in the south-west in 1929.

The following fungi causing tomato diseases have been recorded in Esthonia: *Phytophthora infestans*, *Fusarium* sp., *Cladosporium* sp., *Verticillium albo-atrum*, *Botrytis cinerea*, *Septoria lycopersici*, *Bacterium lycopersici* [ibid., vi, p. 132], *Phoma lycopersici*, and *C. fulvum*, the two last-named having caused very severe injury in 1929 and 1930, respectively. Girth scab of beets, associated with *Oospora cretacea* [*Actinomyces cretaceus*], *A. rosellus*, *A. intermedius*, *A. tenax*, *A. nigrificans*, and *A. violaceus*, was very injurious in 1930 following the mild winter [cf. ibid., i, p. 183; viii, p. 9].

HOPKINS (J. C. F.). **A list of plant diseases occurring in Southern Rhodesia.**—*Rhodesia Agric. Journ.*, xxviii, 7, pp. 663–669, 1931.

This list of plant diseases recorded in Southern Rhodesia between June, 1930 and May, 1931 has been drawn up in continuation of that previously issued [*R.A.M.*, ix, p. 684], certain amendments to which are included.

SMITH (F. E. V.). **Plant diseases in Jamaica in 1930. Report of the Government Microbiologist.**—*Ann. Rept. Dept. of Sci. and Agric. Jamaica for the year ended 31st December, 1930*, pp. 15–19, 1 pl., 1931.

Owing to dry weather conditions there was no marked spread of Panama disease of bananas (*Fusarium cubense*) in Jamaica during the later months of 1930, but nevertheless the incidence of infection was 100 per cent. more than in 1929 [*R.A.M.*, x, p. 43 and below, p. 6]. Field experiments showed that a 10 per cent. solution of Jeyes' fluid or septol was superior to the normal concentrations of corrosive sublimate, bleaching powder, or formalin in the disinfection of the soil against this disease. It is stated on p. 1 that the first cross seedlings of the Gros Michel variety pollinated with Robusta are highly resistant to *F. cubense*. Bonnygate disease and black spot (*Sphaerostilbe musarum* and *Cercospora musarum* [*Helminthosporium torulosum*: ibid., ix, p. 729]) were also prevalent, while *Marasmius* disease [*M. stenophyllus*: ibid., vii, p. 226] occurred in 'Bush' bananas. Chlorosis was much in evidence on marl or limestone soils.

Sugar-cane mosaic was found on most estates, but generally in a fairly mild form, especially where roguing and selection are regularly practised. On p. 8 it is stated that the resistant Uba is gradually being superseded by the P.O.J. varieties, and in some districts where mosaic was formerly very prevalent certain of the more susceptible varieties can now be grown again.

Scab (*Sporotrichum citri*) of sour oranges [*Citrus aurantium*] and lemons was kept well in check in nurseries by systematic spraying with Bordeaux mixture, beginning at the appearance of

the first rough leaves. Where the work of control was not commenced until a later stage good results were obtained by pruning back the affected shoots before spraying. In order to secure nurseries free from scab it is necessary to destroy all sour orange trees in the immediate vicinity before sowing the seed. Wither-tip [*Gloeosporium limetticolum*] was general but not often severe on limes, and also occurred in two young mixed groves of grapefruit and orange. Most of the trees had been budded on grapefruit stock, and the Triumph variety on this stock was severely affected, while Marsh Seedless grapefruit showed less infection and Washington Navel orange on the same stock least of all. Minor troubles of citrus, generally occurring in old trees, include scaly bark, gummosis, and foliocellosis [ibid., x, p. 25] while *Diplodia natalensis* is the cause of considerable loss to growers in certain localities.

Damping-off of coffee (*Rhizoctonia* [*Corticium*] *solani*) is still common in nurseries but is amenable to treatment with Cheshunt mixture [ibid., i, p. 373].

Common scab of potatoes (*Actinomyces scabies*) was serious in some light red soils deficient in humus, while early blight (*Macrosporium* [*Alternaria*] *solani*) was the most severe leaf disease, spraying being ineffectual as a control measure. *Sclerotium rolfsii* was reported as the cause of damage to potato shoots at soil level.

Mosaic of papaw, also reported from San Domingo [ibid., ix, p. 512; x, p. 809], is characterized by dwarfing of the leaves and the production of 'pencil point'; it is prevalent throughout the Island and would necessitate the development of an immune variety (which is believed to exist) in the event of the commercial cultivation of this crop.

Peas were attacked by the root rot due to *Aphanomyces euteiches*.

MARTYN (E. B.). **Plant diseases.**—*Agric. Journ. Brit. Guiana*, iv, 2, pp. 95–100, 2 pl., 1931.

Notes are given on the wilt disease of coco-nuts attributed to unfavourable soil conditions [cf. *R.A.M.*, vii, p. 716; x, p. 361], Panama disease of bananas (*Fusarium cubense*), *Sclerotium* disease of coffee [*S. coffeicolum*: ibid., ix, p. 650], witches' broom of cacao [*Marasmius perniciosus*], wither-tip of limes [*Gloeosporium limetticolum*], and on tomato wilt (*Fusarium lycopersici*) and blossom-end rot [cf. ibid., viii, p. 426].

[WALTERS (E. A.).] **Report on the Agricultural Department, St. Lucia, 1930.**—24 pp., 1931.

In the section of this report dealing with plant diseases (p. 6) it is stated that *Rosellinia* disease of cacao [*R. bunodes* and *R. pepo*: *R.A.M.*, x, p. 161] causes more loss of yield in St. Lucia than any other disease or pest of this host. The replacement of the very susceptible shade tree 'Immortelle' [*Erythrina* spp.] by the highly resistant *Gliricidia* is consistently advised wherever the fungus is prevalent. The use of a tar distillate wash considerably improved the bark wounds and pod rots [*Phytophthora palmivora* and *Botryodiplodia theobromae*] in several plantations.

The survey of coco-nut palms begun in 1927 [loc. cit.] was com-

pleted in 1930, and a definite record of disease sites is now available. The number of trees examined from November, 1927, to May, 1930, totalled 462,704, of which 1,169 or 0·25 per cent. were diseased, all the latter being destroyed, treated, or kept under observation. The percentage incidence of disease was as follows: bud rots [*P. palmivora* or bacteria] 38·7, little leaf 30·8, bitten leaf [? *Ceratostomella paradoxa*] 12·7, stem bleeding 7·1, leaf yellows 5·7, senility 4·3, and withering leaf 0·7 [ibid., ix, p. 90].

BROOKS (A. J.). **Annual Report of the Department of Agriculture, Colony of the Gambia, for the year ended March 31st, 1931.**—51 pp., 1 pl., 1931.

This report contains (pp. 8, 18, 22) the following items of phytopathological interest. The leaves and roots of Philippine Pink groundnuts were attacked by *Macrophomina phaseoli*. On the leaves large, marginal, zonate spots developed. The pycnidia which occurred on the spots of one leaf contained pycnospores measuring 20 to 27 by 7 to 8·5 μ, and these gave rise to the sclerotia of *Rhizoctonia bataticola* in culture. The root attack caused a complete decay of the tap-roots, which were bare to the wood and bore abundant sclerotia of the fungus. *Cercospora personata* was present on all varieties of groundnuts, but all except Philippine Pink eventually recovered. Rosette [*R.A.M.*, x, p. 629] made its appearance about the middle of August, the available evidence indicating that it was insect-borne. In late sowings Philippine Pink groundnuts were more resistant to rosette than either the Basse or the Philippine White variety. The date of the first appearance of the disease depends mainly on seasonal factors, being little affected by the date of sowing.

Plant pathology and physiology.—*Forty-third Ann. Rept. Texas Agric. Exper. Stat., 1930,* pp. 56–67, 1930. [Received September, 1931.]

In the section of this report dealing with investigations conducted during the period under review into cotton root rot (*Phymatotrichum*) [*omnivorum*: *R.A.M.*, x, p. 454] in Texas notes are given on the conditions under which the sclerotia are found, how soon they germinate, and their longevity [ibid., x, p. 186]. The *Hydnum* [loc. cit.] frequently associated with plants killed by *P. omnivorum* does not appear to be related to the latter fungus, no infection being secured when cotton plants were inoculated with the *Hydnum* sporophores.

Further observations showed that *Fusarium lycopersici* [ibid., x, p. 165] is present on tomatoes in different types of soil in Texas, from slightly acid or neutral to highly calcareous. Heavy losses were incurred by tomato growers in all parts of Texas during 1930 from a disease known as 'centre' or 'core' rot, which takes the form of a dark, central spot, not affecting the edible quality of the tomatoes, but making them unmarketable. A yellow and a white bacterium were repeatedly isolated from affected fruit and inoculations of healthy tomatoes with either organism gave positive results. A new form of tomato decay, referred to as 'charcoal rot', in which both the outside and inside of affected fruits turn

black, was also observed, and a fungus was repeatedly isolated from infected material; inoculations of healthy tomato with this organism, which morphologically resembled *Sclerotium bataticola* [*Macrophomina phaseoli*], gave positive results. Spinach wilt (*Fusarium solani*) [ibid., v, p. 405; vi, p. 140] seriously hindered the growth of this crop in south Texas, particularly in the Winter Garden District, the losses varying from 5 to 25 per cent.

Sulphur used in any form to control downy mildew (*Peronospora* [*Pseudoperonospora*] *cubensis*) and powdery mildew (*Erysiphe cichoracearum*) of cantaloupes [ibid., ix, p. 437; x, p. 702], when applied to the foliage was highly injurious to the leaves and vines. Neutral Bordeaux mixture gave the best results, as judged by the yield, the degree of control over both diseases, and the amount of spray injury caused; it was the only treatment which gave a greater yield than was obtained from the untreated controls. When the sulphur, however, was placed on the ground next to the vines and foliage, the applications being made when the plants first began to vine out and repeated frequently as they developed, no injury resulted, and both diseases, which destroyed the untreated controls in this experiment, were apparently controlled.

Kolodust, when applied dry to numerous hosts for the control of powdery mildews, including peas and beans [*E. polygoni*] and roses [*Sphaerotheca pannosa*], was readily washed off by the lightest rain, but when applied immediately after rain or a water spray and then allowed to dry, it adhered much longer than did ordinary flowers of sulphur. Three applications of kolodust gave almost complete control of carnation rust [*Uromyces caryophyllinus*: ibid., ix, p. 654]; ordinary flowers of sulphur were less effective.

Progress in agricultural research.—*Ann. Rept. Missouri Agric. Exper. Stat. for the year ending June 30, 1930* (*Bull.* 300), 107 pp., 6 figs., 1 diag., 9 graphs, 1931.

The following are amongst the items of phytopathological interest (other than those already noticed) in the sections on botany (pp, 56–58) and horticulture (pp. 85–91) of this report. I. T. Scott has continued his studies of various species of *Fusarium* parasitic on economic hosts in Missouri. The following hydrogen-ion equilibrium points were obtained: *F. discolor*, P_H 5·3 to 5·5; *F. niveum*, P_H 6·4 to 6·5; *F. vasinfectum*, P_H 5·5: *F. conglutinans*, P_H 6·8 to 7. A minimum of growth, measured as dry weight of mycelium produced, was obtained at about P_H 7 when *F. conglutinans* was grown in nutrient solutions of different initial P_H values. This growth corresponded closely to the equilibrium point reached when washed mycelial mats of the same fungus were placed in acid or basic salt solutions. There was a definite correlation between the growth of the fungus at different hydrogen-ion concentrations and the equilibrium points obtained in salt solutions, and also a connexion between reaction and the toxicity of various dissociating toxic agents, as previously reported in the case of *F. lycopersici* [*R.A.M.*, vi, p. 367; ix, p. 197].

Pythium arrhenomanes Drechsler, the causal organism of a seedling blight of Dent maize [ibid., vii, p. 778; x, p. 180], was

isolated from diseased maize roots obtained from previously unaffected parts of the State. Seed treated with organic mercury dust disinfectants gave a decreased percentage of infection when planted in *Pythium*-infested soil in the greenhouse. *P. arrhenomanes* appeared to be much more virulent in soil inoculation experiments in the greenhouse when used alone than in conjunction with *Gibberella moniliformis* and *G. saubinetii*.

Javoronkova (Mme I.). Практикум по бактериозам растений. [Practical guide for the study of bacterioses of plants.]—Booklet issued by *Госуд. С.-хозяйств. Издат.* [*State Agric. Publications Office*], Moscow and Leningrad, 64 pp., 18 figs., 1931.

The first part of this booklet, which is intended to serve as a practical guide for the beginner in the study of bacteriology, gives brief but comprehensive instructions for the isolation and growth in pure culture of phytopathogenic bacteria, and also for the preparation of the more usual culture media. The second part is a list (together with brief morphological and cultural descriptions) of the more important species of bacteria that attack economic crops in Russia, arranged by the hosts.

Nolla (J. A. B.). **Studies on the bacterial wilt of the Solanaceae in Porto Rico.**—*Journ. Dept. Agric. Puerto Rico*, xv, 3, pp. 287–308, 4 pl., 1931.

Solanaceous plants in Porto Rico are stated to be liable to a bacterial disease, the causal organism of which is believed to be a strain of *Bacterium solanacearum* differing from the type species in its inability to infect tobacco.

Four potato varieties, viz., Bliss Triumph, Irish Cobbler, Green Mountain, and Spaulding Rose, were found to be susceptible, while severe infection occurs also on a number of imported eggplant varieties, e.g., Black Beauty, Excelsior, New York Spineless, and Large Round Purple, and tomatoes, especially Ponderosa. Pepper (*Capsicum baccatum*) is also susceptible, though less so than the foregoing, the heaviest infection being found on Early Giant and Ruby Giant and the least on Chinese Giant, Worldbeater, and Bull Nose. The Porto Rican eggplant varieties, Camuy and Long Green, are highly resistant to *Bact. solanacearum* and the Marglobe and Marvelosa tomatoes moderately so. Bacterial wilt has also been observed on zinnia (*Crassina* [*Zinnia*] *elegans*), *Solanum torvum*, and *S. nigrum*.

The symptoms of bacterial wilt include yellowing and withering of the young shoots and leaves, followed by general wilting of the whole plant, and sometimes accompanied by lesions resembling those due to scalding water or scorching by strong sunlight. Cankers are occasionally formed in tomatoes. The vascular bundles of diseased plants show a brown discoloration.

The causal organism was found to lose its virulence very rapidly on most artificial media. Successful inoculations were obtained when the inoculum was used directly from the original isolation on the poured plate, while those made with the bacterial exudate obtained in a more or less uncontaminated state from the vascular

bundles of diseased plants scarcely ever failed. Natural infection takes place through wounds in the leaves and roots. The green beetle (*Diabrotica graminea*) was found to be concerned in the dissemination of the pathogen, which appears to remain viable in the soil for a number of years in manure, plant débris, and the like. The first appearance of the bacterial wilt has been observed to coincide with periods of protracted rainfall followed by dry spells. A promising means of control is offered by the development of resistant strains of the affected plants, and breeding experiments with the eggplant are already in progress.

NABELEK (A.). **Le cancer des plantes, maladie des cicatrices.** [Plant cancer, a cicatricial disease.]—Reprinted from *Les Néoplasmes, 1931*, 24 pp., 16 pl. (4 col.), 1931.

This is a French version of the author's previously noticed paper on the problem of cancer in plants associated with infection by *Bacterium tumefaciens* [*R.A.M.*, x, p. 708].

CIFERRI (R.). **Studies on Cacao.**—*Journ. Dept. Agric. Puerto Rico*, xv, 3, pp. 223–286, 1 pl., 1 diag., 6 graphs, 1931.

During 1926 and 1927 the writer carried out investigations in the Dominican Republic on (*a*) the numerical distribution of the mould spores on dry fermented and unfermented healthy cacao beans, as well as on moulded ones; (*b*) the identification of the moulds isolated; and (*c*) the comparative growth of the most common moulds on pasteurized fermented and unfermented cacao beans [*R.A.M.*, vii, p. 22; ix, p. 163].

The following organisms were found to be normally present in samples of Sánchez cacao beans: *Aspergillus niger*, *A. fumigatus* [ibid., ix, p. 632], *A. flavus*, *A. glaucus*, *Penicillium leucopus*, *Rhizopus nigricans*, *Mucor mucedo*, *Spicaria lateritia*, and *Cephalosporium acremonium*, while others of less frequent occurrence were *A. tamarii*, *A. nidulans*, *A. candidus*, *P. notatum*, strains of *Penicillium* closely related to, or identical with, *P. luteum*, *P. roseum*, and *P. candidum*, *R. arrhizus*, *M. racemosus* or a closely allied strain, *Trichothecium roseum*, *Helminthosporium cacaophilum* Cif. n. sp., *Macrosporium commune* [*M. sarcinula*: ibid., x, p. 430], *Pullularia* (*Dematium*) *pullulans*, *Alternaria tenuis*, *Catenularia fuliginea* [*Torula sacchari*: ibid., x, p. 656], *Dendryphium congestum* Cif. n. sp., (?) *Coniothecium effusum*, *Blastoconium tropicum* Cif. n. g., n. sp., (?) *Hormodendrum pallidum*, *Fusarium sarcochroum* or a closely related form, and a variety of *F. zonatum*. Notes are given on the two last-named, and English diagnoses of the new species are furnished.

The normal moisture content of fermented and unfermented cacao beans was found to range from 14 to 21 per cent., with a general average of 19 per cent. It was ascertained that a relative humidity of 79 per cent. permits the development of moulds after 16 days' incubation on fermented cacao, the minimum time required for this process being 8 days at a relative humidity of 90 per cent. It is concluded from these studies that both climatic and meteorological conditions in the Dominican Republic are often favourable to the development of moulds on cacao beans, especially in conjunc-

tion with the defective methods of cacao preparation in common use. Some suggestions are made for the improvement of these methods, with particular reference to drying, as well as for better conditions of storage.

The second part of this paper deals with the yeasts occurring in Dominican cacao. [A French summary of this paper is published in *Boll. Sez. Ital. della Soc. Internaz. di Microbiol.*, iii, 10, pp. 666–671, 1931.]

APPEL (O.) & SCHEIBE (A.). **Beobachtungen über die Verbreitung der einzelnen Getreiderostarten in Deutschland, insbesondere im Jahre 1930.** [Observations on the distribution of the individual cereal rust species in Germany, especially in the year 1930.]—Reprinted from *Mitt. Deutsch. Landw. Gesellsch.*, [xlvi], 4, 2 pp., 1931.

During 1930 a systematic survey was made of 577 collections of cereal rusts from different parts of Germany. The first record of dwarf rust on barley (*Puccinia simplex*) [*P. anomala*] was dated 24th May (Silesia) and the last 5th September (East Prussia). According to observations by Hey [see below, p. 36], *P. anomala* can develop at very high temperatures (30° C. and above) as well as at relatively low ones [cf. *R.A.M.*, x, p. 442].

Very little infection of wheat and barley by *P. glumarum* was recorded in 1930, partly owing to the high spring temperatures following the hot late summer of 1929, a parallel to which may be found in the similar conditions of 1921–2 [cf. ibid., x, p. 714]. On barley this rust seems to be almost entirely confined to the Baltic coast from the Danish-German frontier to East Prussia.

Both wheat and rye were severely attacked by brown rust (*P. triticina* and *P. secalina*) in a number of districts, infection beginning in the south-eastern and south-western provinces with a continental climate and spreading over the entire country with rising summer temperatures [cf. ibid., ix, p. 768].

A striking correlation has been observed between the incidence of black rust (*P. graminis*) and the distribution of barberry [cf. ibid., vi, pp. 83, 320]. The disease is particularly severe on late-maturing wheat and oat varieties in the Lower Alps, so much so that in Upper Bavaria the development of early varieties is one of the chief objects of cereal breeding. Rye is attacked by *P. graminis* principally in the north-eastern districts, where oats are also sometimes severely affected; on barley the disease occurs almost exclusively in south Germany.

In the south-eastern districts of East Prussia, oats have been largely replaced by barley or the two cereals are mixed, on account of damage by *P. lolii*, the high temperature optimum of which favours its development on late maturing varieties [ibid., ix, p. 770].

RAEDER (J. M.) & BEVER (W. M.). **Spore germination of Puccinia glumarum with notes on related species.**—*Phytopath.*, xxi, 8, pp. 767–789, 3 figs., 1931.

The optimum humidity and temperature for the retention of germinability of the uredospores of *Puccinia glumarum* were found to be 49 per cent. and 9° to 13° C., respectively. Uredo-

spores under these conditions remained viable for 88 days, the corresponding periods for two forms of *P. graminis* being 120 and 128 days, respectively. Uredospores of *P. triticina* were viable for 124 days at a temperature of 3° to 11° and a relative humidity of 49 per cent.

Transferring uredospores after all germination had ceased at 29° to 30° to temperatures of 9° to 10° for 48 hours resulted in renewed germination in all three rusts, viability being thus extended for 6 days in *P. glumarum* and for 11 and 8 days, respectively, in *P. graminis* and *P. triticina*. Similarly, when uredospores were transferred from freezing point, after germination had ceased, to room temperature (23° to 26°) for 48 hours, those of *P. glumarum* germinated for 4 days longer and those of *P. graminis* and *P. triticina* 6 days longer.

At the temperatures prevalent in an ordinary ice refrigerator the teleutospores of *P. glumarum* retained their germinability longer than at 28° to 30°. Teleutospores incubated under these conditions had apparently lost their germinability by the following spring, but were revived by various stimuli (citric, boric, hydrochloric, and other acids). A marked increase of germination was obtained by the exposure of teleutospores to a combination of high humidity and freezing temperature.

The authors' investigations do not afford sufficient evidence to explain the absence of *P. glumarum* east of the 103rd meridian in the United States, and further studies on various phases of the problem are necessary for its elucidation.

NEILL (J. C.). **Effects of rusts and mildew on yield and quality of Wheat.**—*New Zealand Journ. of Agric.*, xliii, 1, pp. 44–45, 1 graph, 1931.

A brief account is given in popular terms of an experiment conducted at the Plant Research Station, Palmerston North, New Zealand, to ascertain the actual loss in yield caused in wheat by leaf and stem rusts (*Puccinia elymi* [*P. triticina*: *R.A.M.*, iv, p. 213] and *P. graminis*, respectively) and mildew [*Erysiphe graminis*] under conditions favourable to maximum attack.

Plots were sown in August, 1930, with certified seed of eight [named] varieties of wheat, and were transversely divided in half by cloth screens, one half of each plot being well dusted at weekly intervals with Alpha sublimed sulphur. Dusting was begun on 15th November, and the first traces of *P. triticina* and *E. graminis* were detected on both the dusted and undusted plots on 25th November, *P. graminis* developing later. The plots were harvested on various dates between 2nd and 19th February, according to the ripeness of each variety. The dusting was effected early in the evening. The weather was very broken during the period of the experiment, and there was an almost constant succession of high winds with a low average temperature.

The results obtained [which are tabulated and expressed graphically] showed that the dusted halves of the plots outyielded the undusted halves by from 17 to 96 per cent. by weight, the amount of the increase being directly correlated with the relative severity of the rust attack in all but one of the varieties. The estimated

incidence of *P. graminis* and *P. triticina* in the dusted plots varied from 0 to 4 and 0 to 10 per cent., respectively, and in the undusted from 3 to 80 and 5 to 95 per cent. Mildew was present in all the undusted plots, Major, Solid-straw Tuscan and, particularly, Velvet being the most severely affected, while there was only a trace in the dusted plots. The increased yield of the dusted plants was due chiefly to the greater weight of the individual grains, and only to a much less extent to any increase in the number of grains per head.

Dodoff (D. N.). **Физиологически раси на кафявата ръжда по Пшеницата (Puccinia triticina Erikss.)** въ България. [Physiological forms of leaf rust of Wheat (*Puccinia triticina* Erikss.) in Bulgaria.]—Reprinted from *Земледѣлска Мисъль* [*Agricultural Thought*], Sofia, ii, 2, 34 pp., 6 figs., 1 map, 1931. [English summary.]

This is a detailed account of the author's investigation in 1930 of wheat brown rust (*Puccinia triticina*) material collected from six widely separated localities in Bulgaria, for the purpose of determining the physiological forms of the fungus that occur in that country [*R.A.M.*, x, p. 648]. The experiments were made by means of single spore inoculations on eleven differential hosts [a list of which is given] in the greenhouse. The results [which are presented in tabular form] indicate the existence in Bulgaria of the already known forms XIII, XV, XVII, XIX, XX, XXI [ibid., ix, pp. 366, 768], and of a new form XXIV, which differs from forms XIII and XXI only in the reaction caused by it on the differential varieties Democrat C.I. 3384 and Mediterranean C.I. 3332. On the former, which is resistant to form XIII, form XXIV causes a reaction of an indeterminate character (infection type x) [ibid., ii, p. 159], in which symptoms proper to different types of infection frequently appear on the same leaf and cannot be mechanically separated. Mediterranean C.I. 3332 is resistant to form XXIV and susceptible to form XXI.

The most prevalent forms in Bulgaria appear to be XIII in the north and XX in the south. Form XXIV was found in three localities, and the remaining forms were only sporadic.

Bressman (E. N.). **Varietal resistance, physiologic specialization, and inheritance studies in bunt of Wheat.**—*Oregon Agric. Exper. Stat. Bull.* 281, 44 pp., 6 figs., 2 diags., 1 map, 1931.

This is an extended account of the author's observations in Oregon on physiologic specialization in, and varietal reaction and inheritance of resistance to wheat bunt (*Tilletia levis* and *T. tritici*) [*T. foetens* and *T. caries*], a preliminary note on which has already been published [*R.A.M.*, x, p. 372].

The ten forms of bunt differentiated on the basis of these studies, viz., six of *T. foetens* and four of *T. caries*, have been designated by the numbers I to X (the first 6 numbers being *T. foetens*) and are distinguished according to their capacity for infection on the varieties Albit, Hussar, Ridit, and Oro. Of these III and VIII predominated. Bunt collections designated as 7c

and 8*a* include other forms less readily differentiable with the varieties here used as indicators. Collection 7*c* is so slightly virulent that it is difficult to maintain. Form IX of *T. caries*, one of the most virulent used in these trials, and the only one showing slight morphological differences, was collected in an important wheat-growing section of eastern Oregon. A similar collection (71), originating in Czecho-Slovakia, was obtained from the Brooklyn Botanic Garden. Collections producing similar reactions on the differential wheat varieties to six foreign ones (from Sweden, Norway, Italy, Czecho-Slovakia (2), and New Zealand) have been found in the United States, and there is no direct evidence that the recently determined physiologic forms of bunt in the latter country are the result of introductions from abroad, though some of the more virulent ones may be. *T. foetens* is more commonly found east of the Rocky Mountains while *T. caries* predominates west of this range. The writer, however, does not attach great importance to this distribution or to the specific differences, which he considers to be outweighed by the divergences between the forms. The optimum temperature for spore germination in water differed widely (from 6° to 18° C.) in the different forms.

Turkey × Bearded Minnesota is the only variety hitherto tested that proved highly resistant to all the 94 collections of bunt used. The Martin, White Odessa, Albit, Regal, Hussar, Banner Berkeley, and Ridit varieties, reputed to be immune or resistant, were all found to be susceptible to one or more forms of the fungus. Inheritance studies showed that certain varieties, represented by White Odessa and Hussar, possess one or more factors for resistance to some forms and no such factors where other forms are involved [cf. ibid., ix, p. 515]. This fact emphasizes the need, not only of pure-line material for parents, but also of a pure form of bunt in inheritance experiments.

In connexion with a discussion of the relative merits of the different wheat varieties adapted for use in a breeding programme for bunt resistance, it is pointed out that all those of value have red kernels. White Odessa, Albit, Martin, Regal, and Banner Berkeley contain the same genetic factor for bunt resistance, while the two last-named may also have modifying factors for this character. In a breeding programme, any one of these five varieties could be used to represent the whole group. Hussar may be of more value than any of these on account of its greater resistance. Hohenheimer and Ridit should be used together with Hussar in a breeding programme to develop varieties resistant to all these forms of bunt. The 'pure line' method of selecting heads of bunt, as used by Dillon Weston [ibid., viii, p. 436] and the writer, has been found useful for obtaining virulent bunt, of which a strain that readily attacks Ridit was developed in this way.

REICHERT (I.). **A new strain of Tilletia tritici in Palestine.**— *Ann. of Appl. Biol.*, xvii, 4, pp. 720–724, 1930.

The results [which are discussed and tabulated] of three years' experiments indicated that the immunity of the Florence and Bunyip wheat varieties from bunt (*Tilletia tritici*) [*T. caries*] in

Palestine is purely local, being limited to the strain of the fungus prevalent in that country and possibly also to a Danish collection [*R.A.M.*, x, p. 302]. Both varieties were infected in Palestine by German, Dutch, and Swiss strains. The Palestine strain of *T. caries* may, therefore, be regarded as a new one.

Generally speaking, the various foreign bunt collections tested were found to maintain their virulence in Palestine under climatic conditions differing from those of the countries of origin. The Welsh collection, however, was unable to attack either the local or Welsh stocks of Florence in Palestine, though it did so in Wales.

ABRAMOFF (I. N.). Протравка семян формалином в опилках. [Disinfection of seeds with sawdust impregnated with formalin.]—*Plant Protection*, Leningrad, viii, 2, pp. 155–159, 1931.

After pointing out the unreliability of dust fungicides for the control of cereal smuts under East Siberian conditions, and the drawbacks presented by the usual method of treating the seed-grain with formalin, the author states that preliminary experiments [some details of which are given] in 1930 at the Russian Far East Plant Protection Station showed that wheat bunt [*Tilletia caries* and *T. foetens*] and oat smut [*Ustilago avenae*] can be effectively controlled by mixing the seed-grain with sawdust impregnated with formalin. In the tests pine wood sawdust, previously sifted to separate it from the coarser particles, was steeped until saturation (30 to 40 minutes) in various concentrations of formalin (from 1 in 5 to 1 in 300), and after drawing off the excess liquid was mixed with the seed-grain at the rate of 1 kg. sawdust (dry weight) to 100 kg. grain, which was then covered for two hours with tarpaulins. The grain thus treated may be either used immediately, without separating it from the sawdust, which did not appear to interfere with the working of the drills, or may be stored for later use; in the latter case, the sawdust should be separated from the grain before sowing by means of the usual grain separators or cleaners, and may be again used for further treatment. Concentrations of formalin up to 1 in 100 appeared to have a stimulating effect on the germination of wheat seed, as measured by the density of the resulting stands, but 1 in 50 reduced the density of the stand by over one quarter, and still higher concentrations inhibited germination entirely; oats were apparently more resistant, since the 1 in 50 solution only slightly affected the stand and 1 in 10 reduced it from 100 per cent. (control standard) to 31. In conclusion, the author points out the great elasticity in the use of this method, since the dosage of formalin can be varied by increasing or decreasing the amount of the sawdust added to the seed-grain, the concentration of the formalin solution, and the length of time during which the treated grain is left covered with tarpaulins.

HANOW. **Die Fortschritte der Trockenbeizung.** [The progress of dusting.]—*Nachricht. über Schädlingsbekämpf.*, vi, 3, pp. 65–74, 6 figs., 2 diags., 1931.

An account is given in popular terms of the rapid and continuous

extension in Germany of the dry method of seed disinfection, with special reference to the treatment of seed-grain with ceresan [*R.A.M.*, x, p. 512 *et passim*]. This preparation is stated to have been extensively tested in a number of foreign countries, where it has received widespread recognition and official recommendation. Some of the standard dusting apparatus are illustrated, and brief notes are also given on the sprinkling, immersion, and short disinfection processes.

HESSE (G.). **Originalsaatgut, seine Aufarbeitung und Beizung.** [Original seed, its preparation and disinfection.]—*Nachricht. über Schädlingsbekämpf.*, vi, 3, pp. 75–78, 2 diags., 1931.

In order to meet the demand for large quantities of treated seed-grain, a number of seed selection stations throughout Germany are stated to be furnished with continuously working dusting apparatus, chiefly Gross-Tillator [*R.A.M.*, x, p. 373]. The seed-grain is treated with ceresan [see preceding and next abstracts] as officially recommended for use with wheat, barley, oats, and rye.

STOCKER (W.). **Genossenschaftliche Saatgutbeizung.** [Co-operative seed disinfection.]—*Nachricht. über Schädlingsbekämpf.*, vi, 3, pp. 79–83, 2 diags., 1931.

The writer briefly outlines the advantages of the co-operative method of seed-grain disinfection with ceresan [see preceding abstracts], which has given excellent results during the past two years in Saxony. The number of co-operative disinfecting apparatus in the province is estimated at 100, and that of co-operative seed-cleaning plants at 800, of which at least 90 per cent. are furnished with dusting drums.

HEY (A.). **Beiträge zur Spezialisierung des Gerstenzwergrostes Puccinia simplex Erikss. et Henn.** [Studies on the specialization of dwarf rust of Barley, *Puccinia simplex* Erikss. et Henn.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 3, pp. 227–261, 1931.

A comprehensive and fully tabulated account is given of the writer's investigations at Dahlem, Berlin, on specialization in dwarf rust of barley (*Puccinia anomala*) [see above, p. 31].

The physiological conditions governing infection by dwarf rust were found to be very similar to those obtaining in the case of the other brown rusts, viz., *P. dispersa* [*P. secalina*], *P. triticina*, and *P. coronifera* [*P. lolii*], especially the first-named. The development of *P. anomala* is most abundant at a temperature of 16° to 20° C. with a relative atmospheric humidity of 70 to 80 per cent., but it can take place up to 30° or more and also at low temperatures.

From 17 dwarf rust collections eight physiologic strains were isolated by the type of infection they produced on 10 standard species and varieties of *Hordeum* [which are listed]. Four of these forms appear to be widely distributed, while the remainder are probably of minor importance. Two of them from different parts of Germany showed a tendency to form teleutosori only on certain barley varieties. On an unnamed variety, as well as on

Breustedt's Schladener and Friedrichswerther Berg winter barley the teleutosori were produced in circular groups, while on other varieties they were formed in lines.

The results of extensive tests on the reaction to the different physiologic strains of *P. anomala* of 273 barley varieties showed that by far the greater number in the two main groups, *H. polystichum* and *H. distichum*, are susceptible. The former, however, comprises some varieties which are resistant to most of the physiologic strains of the rust, e.g., Australian Recka, 4-rowed Samaria, and 6-rowed Egyptian, while the Friedrichswerther Berg and Breustedt's Schladener winter varieties remained immune from infection by three strains. In the *distichum* group resistance was shown only by a few varieties to the local physiologic forms of lesser importance. A high degree of resistance to infection by *P. anomala* was shown by the wild grasses, *H. murinum*, *H. bulbosum*, *H. jubatum*, *Elymus canadensis*, and *Aegilops* spp., as well as by some varieties of oats and rye that were tested; Heine's Kolben wheat, on the other hand, developed severe necrosis as a result of inoculation. Generally speaking, the susceptibility of the susceptible varieties was maintained throughout the range of temperatures used in the tests (minimum 8°, maximum 30°), whereas the resistant varieties reacted differently to the various physiologic strains according to the temperature. Absolute resistance, as interpreted by Gassner and Straib [ibid., ix, p. 99], was shown only by Australian Recka to seven of the strains, while 4-rowed Samaria, Lichti's Lechtaler, and Ackermann's Bavaria were each resistant to two.

WINKELMANN (A.). **Streifenkrankheit und Blattfleckenkrankheiten der Gerste.** [Stripe disease and leaf spot diseases of Barley.]—*Deutsche Landw. Presse*, lviii, 35, p. 482, 1931.

Popular notes are given on the leaf spot diseases of barley caused by *Helminthosporium teres* and *Marssonina graminicola* [*Rhynchosporium secalis*], which are stated to have been very prevalent in Germany during the past season [*R.A.M.*, vi, p. 26; viii, p. 639], and on the means of distinguishing them from stripe disease (*H. gramineum*).

HOLTON (C. S.). **Hybridization and segregation in the Oat smuts.**—*Phytopath.*, xxi, 8, pp. 835–842, 4 figs., 1931.

The writer's studies on hybridization between the two oat smuts *Ustilago avenae* and *U. levis* [*U. kolleri*] have shown that they are perfectly interfertile [*R.A.M.*, x, p. 304] and can produce smut on Anthony oats. Sporidial fusions and infection only occur with monosporidial lines of the opposite sex. The hybrids caused infection of the loose smut type.

A cross between two monosporidial lines originating from the smut spores developed from a hybrid infection produced an apparently new buff type of smut on Liberty Hull-less oats. The spores of this smut were smooth and apparently colourless, in contrast to the dark brown ones of the common oat smuts.

Segregation for sex factors in *U. avenae* and *U. kolleri* was found to be on a 2 : 2 ratio. Strong evidence is adduced in favour

of the occurrence of delayed segregation of factors for certain cultural characters in both smuts, based on the fact that monosporidial lines originating from the same segment of the promycelium often exhibit marked differences in this respect [cf. ibid., viii, p. 298].

MARSCHNER (G.). **Etwas über den Roggenstengelbrand.** [Notes on stem smut of Rye.]—*Nachricht. über Schädlingsbekämpf.*, vi, 3, pp. 93–94, 1 fig., 1931.

A popular account is given of stem smut of rye (*Urocystis occulta*), which was first observed in the Niederlausitz district of Germany in 1929 [*R.A.M.*, ix, p. 47], causing 10 to 15 per cent. infection in one stand. The seed-grain for the same field was treated the following year with ceresan, which reduced the incidence of infection to a minimum.

ESMARCH (F.). **Das Mutterkorn.** [Ergot.]—*Die Kranke Pflanze*, viii, 8, pp. 113–115, 1931.

A brief, popular account is given of the symptoms and life-history of ergot of rye (*Claviceps purpurea*) in Germany, with notes on its medicinal and toxic properties, and directions for control by collection of the sclerotia before harvest time and other cultural measures.

KREITMAIR (H.) & KÜSSNER (W.). **Über den Alkaloidgehalt von Claviceps purpurea bei Kultivierung auf künstlichem Nährboden.** [On the alkaloid content of *Claviceps purpurea* in culture on an artificial medium.]—*Biochem. Zeitschr.*, ccxxxix, 1–3, pp. 189–192, 3 figs., 1 graph, 1931.

The authors' experiments were conducted to ascertain whether *Claviceps purpurea*, when grown on an artificial medium, contains the specific alkaloids of ergot (ergotoxin and ergotinin) on which its remedial properties depend [cf. *R.A.M.*, i, p. 423; x, p. 375]. The medium selected consisted of 0·025 per cent. magnesium sulphate, 0·1 per cent. primary potassium phosphate, 0·5 per cent. magnesium-ammonium phosphate, 1 per cent. asparagin, 5 per cent. each of gelatine and glucose, and 10 per cent. rye meal. After two to three weeks the mycelial clusters, which had reached the size of lentils, were transferred to Kolle flasks, one series of which contained the above-mentioned solid medium, while the others were filled with a liquid medium (1 part of rye meal to 10 of water, with 1 per cent. asparagin and 5 per cent. glycerine). Three to four days after inoculation a brown mycelium developed, the structure of which was similar on both media, viz., a fairly compact hyphal network without pseudoparenchymatous stromata. This formed the dark brown *Sphacelia* stage of the fungus [ibid., viii, p. 560], but with relatively sparse conidial production.

The determination of the alkaloids was then made after washing the fungus and drying it at 37° C. Chemical tests for alkaloid reaction gave positive results. The cornutin reaction was detected by means of the blue zone developing in the residue after soda precipitation. The biological test, based on the capacity of the

active ergot alkaloids to counteract or reverse the effects of adrenalin in animals or isolated animal organs, also gave positive results.

HOPKINS (J. C. F.). **Mycological notes. Diplodia—an opponent of Maize growing.**—*Rhodesia Agric. Journ.*, xxviii, 7, pp. 651–652, 1931.

After referring to the great discouragement felt by Rhodesian growers owing to the ravages of the so-called *Diplodia* disease of maize [*D. zeae* and *Gibberella saubinetii*: *R.A.M.*, x, p. 586], the author emphasizes the fact that numerous field and laboratory tests have conclusively demonstrated that treatment of the seed with a suitable dust definitely increases the yield; further preventive measures consist in the selection of cobs free from any sign of mouldiness and well covered by the husks, and the destruction of old trash.

MAHER (C.). **Ear rots and root rots of Maize in Kenya.**—*Kenya Dept. of Agric. Bull.* 5 of 1931, 28 pp., 2 pl., 1931.

In this paper (to which a foreword is contributed by G. L. Burton) a detailed account is given of the various manifestations of the seedling blight and root, stalk, and ear rots of maize in Kenya, caused by *Fusarium* spp. and *Gibberella saubinetii* in association with poor soil conditions and other unsuitable environmental factors. Full directions are given for the control of the diseases by seed selection and treatment, coupled with sanitary measures in the field.

SIRAG-EL-DIN (A.). **The Citrus twig gum disease in Egypt.**—*Min. of Agric. Egypt. Mycol. Res. Div.* (*Plant Protect. Sect.*). *Bull.* 109, 63 pp., 17 pl. (2 col.), 2 graphs, 1931.

An account is given of the twig gum disease of citrus, which is stated to be causing considerable and increasing damage in all parts of Egypt where the climate is warm and damp and the soil fertility very high, as well as in low-lying and badly drained situations. Typical symptoms of the disease are the sudden wilting and dropping of the leaves, accompanied by withering and die-back of the twigs to a distance of 30 to 60 cm. from the tips. At the base of the dead portion the bark splits and gum is exuded in considerable quantities.

The fungus isolated from diseased material was identified by Dr. H. W. Wollenweber as *Fusarium solani* [*R.A.M.*, x, p. 450]. It was cultured on a number of standard nutrient media, of which acid potato proved the most suitable, while the optimum temperature for growth was 20° to 25°. The organism is characterized by non- to biseptate, ellipsoidal, ovoid to fusoid, or comma-shaped, hyaline microconidia, measuring 11·2 to 21·2 by 3·7 to 4·2 μ; non- to 5-septate, hyaline macroconidia, 26·3 to 36·8 by 4·4 to 6·3 μ; and terminal or intercalary, spherical, non-septate chlamydospores, 8·7 by 7·3 μ.

Inoculation experiments with *F. solani* gave positive results on orange twigs, some of which developed gumming and others wilting. Inoculation tests on different citrus varieties showed that citron

[*Citrus medica*] was the most susceptible, followed by sweet orange and mandarin, while sour orange [*C. aurantium*] and rough lemon proved resistant.

SIMMONDS (J. H.). **Cobweb or pink disease of Citrus.**—*Queensland Agric. Journ.*, xxxvi, 1, pp. 16–19, 2 pl., 1931.

In this popular account of the symptoms of cobweb or pink disease (*Corticium salmonicolor*) [*R.A.M.*, x, p. 25], which has been prevalent on citrus trees in the coastal regions of Queensland during the rainy season in recent years, the author states that under local conditions the well-known salmon-pink incrustation characteristic of the fruiting stage is less common than the cobweb appearance which the disease sometimes takes. In this, cobweb-like threads spread out over the bark of the affected branch, growth being superficial at first but later penetrating and killing the bark and woody tissue. On old lesions the cobweb formation may be indistinct, but the sterile pustule stage may appear, in which light brown or faintly pink pustules, consisting of aggregated or fused fungal threads not more than one thirty-second of an inch high burst through the bark over the affected region in longitudinal rows.

The *Necator* stage is not very common in Queensland; it takes the form of orange-red eruptions through the bark, from which irregular spore-like cells are produced, which serve to spread the disease when washed or blown on to healthy branches.

Control consists in the immediate removal of affected branches, which should be cut off at least 18 in. below the last point where the disease can be detected; the cut end and 18 in. of the branch should be tarred and the tree frequently re-examined. All diseased wood should be burnt. If the disease has unwisely been allowed to reach the spore-bearing stage, the branches should be sprayed during the wet season with 6–4–40 Bordeaux mixture with resin.

KENDALL (T. A.). **Soil aeration used in treatment for Oak root fungus.**—*Monthly Bull. Dept. of Agric. California*, xx, 2, pp. 165–166, 1931.

Several citrus trees near Rivera, California, were found, in March, 1929, to be severely attacked by *Armillaria mellea* [*R.A.M.*, ix, p. 303], the main roots being infected, and the foliage turning yellow and falling. The diseased individuals were situated round a badly infected pear [ibid., ix, p. 331 *et passim*], which was removed a fortnight after thorough gassing with carbon bisulphide (1 to 1½ oz. placed in holes 1½ ft. deep). The root systems of the citrus trees were then uncovered for a radius of about 2 ft. from the trunk and 2 ft. down the tap-roots. The roots girdled by the fungus were removed, and the infected bark cut away from the less severely attacked roots for at least six inches beyond the last visible mycelium. Dehydrated lime was applied to the soil as a drying agent at the rate of 15 lb. per tree, and the uncovered trunk and tap-roots were kept as dry as possible. Only one of the roots examined in 1930 showed live mycelium. The total cost of the initial treatment is estimated at $3·17 per tree and that of the final inspection at $1 per tree.

COPELAND (E. B.). **The Coconut. Third Edition, revised.**—xviii + 233 pp., 22 pl., 1 plan, London, Macmillan & Co., 1931.

In Chapter III of this book, dealing with the diseases and pests of coco-nuts (pp. 34–116), some attempt has been made to bring the information on this subject up to date, but the descriptions in most cases are brief and the literature references scanty. Most space is given to bud rot, one form of which is considered to be absolutely demonstrated to be due to *Bacillus coli*, while another is tentatively attributed to *Phytophthora palmivora*. Little reference is made to the obscure wilts of the palm that have recently attracted so much notice in the West Indies [*R.A.M.*, x, p. 452].

MAYNE (W. W.). **Observations on spraying experiments.**—*Planters' Chron.*, pp. 315–317, 1931.

In May, 1930, a comprehensive series of experiments was undertaken at the Coffee Experiment Station, in Mysore, India, to ascertain the relative effects of various spray mixtures [used chiefly against *Hemileia vastatrix*: *R.A.M.*, x, p. 239] on the coffee plant. The unit taken on which to base the observations consisted in a crop-bearing branch of 14 to 18 joints, with its side shoots, and records were made of the number of shoots, adult leaves, and diseased leaves on the branch. The following figures were obtained for the number of leaves per growing shoot of each branch system treated: linseed Bordeaux mixture (10 oz. linseed) $6{\cdot}35 \pm 0{\cdot}21$; casein Bordeaux mixture, $5{\cdot}9 \pm 0{\cdot}18$; resin soda Bordeaux mixture $5{\cdot}5 \pm 0{\cdot}16$; alum Bordeaux mixture $5{\cdot}38 \pm 0{\cdot}24$; resin soda Burgundy mixture $4{\cdot}87 \pm 0{\cdot}18$; 3 per cent. solbar $3{\cdot}1 \pm 0{\cdot}11$. The corresponding figures for the unsprayed control were $2{\cdot}4 \pm 0{\cdot}13$.

JACZEWSKI (A. A.). Болезни Хлопчатника. [Cotton diseases.]—*Bull. of Appl. Bot., Genetics, and Plant-Breeding*, Leningrad, xxiv, 5, pp. 3-294, 26 figs., 1931.

After a brief but comprehensive review of the Russian and foreign literature dealing with the diseases of cotton up to the end of 1929 [the bibliography of which, at the end of the volume, comprises over 300 titles], the author gives considerable details of the phytopathological investigations carried out under his supervision in 1929 and 1930 in the cotton plantations in Russian Central Asia and the plantations recently established in Azerbaidjan, the government of Astrakhan, and North Caucasus. The chief diseases which threaten the cotton industry in those areas are stated to be bacteriosis, wilt, root rots, and boll and lint rots. Besides *Bacterium malvacearum* [*R.A.M.*, x, p. 595], which is widespread in all the regions surveyed, the investigations confirmed the occurrence in them of *Bact. erivanse* and *Bact. löhnisi* [ibid., v, p. 161], and it appears probable that other strains of bacteria will be found to be implicated in certain local forms of bacteriosis. Wilt was found to be caused mainly by a strain of *Fusarium vasinfectum* which does not produce a lilac odour in pure culture on rice or milk, and is considered to be Wollenweber's var. *inodoratum*, though a strain giving this smell was occasionally isolated from cotton in Daghestan. In some localities wilt was also found to be associated with *Verticillium albo-atrum* [cf. ibid., ix, p. 380]. In general, *Fusarium*

wilt is more prevalent in the areas with a hotter climate, while the *Verticillium* wilt develops chiefly under more temperate conditions. The causes of the cotton root rots investigated have not yet been definitely established; although *Ozonium omnivorum* [*Phymatotrichum omnivorum* : ibid., x, p. 662] is fairly widespread in the soil, it has not yet been found attacking the cotton plant. A considerable portion of the book is dedicated to the organisms which were isolated from cotton boll and lint rots, some preliminary information on which has already been noticed from a previous paper [ibid., ix, p. 307]. Among others, *Nematospora gossypii* [ibid., x, p. 519] is stated to have been isolated from cotton fibres from Fergana.

NAOUMOFF (N. A.). Результаты работ по изучению грибных болезней саранчи—**Schistocerca gregaria.** в Средней Азии летом **1929** г. [Results of the investigation of the fungal diseases of locusts (*Schistocerca gregaria*) in Central Asia during the summer of 1929.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 115–124, 1931.

The investigation of the high mortality which was observed during the summer of 1929 among the migratory and local population of locusts (*Schistocerca gregaria*) in Russian Central Asia showed definitely that it was not caused by parasitic fungi, but was either due to the activity of a parasitic fly, the larvae of which were invariably present in all the dead individuals (both in the larval and instar stages) and in most of the living ones that were examined, or to the use of poisoned bait which was broadcast during the spring. Both the living and dead locusts were found to carry a copious fungal flora, e.g., two species of *Fusarium*, one of *Mucor*, and various representatives of *Aspergillus* (*A. niger* group), *Alternaria, Cladosporium, Helminthosporium*, and others, but in no case was the mycelium of any of these organisms found in the internal tissues or cavities of the insects, and none was capable of penetrating the living or dead tissues even under optimum conditions, but only grew and sporulated on the surface.

MASON (F. A.). **Entomogenous fungi from a Derbyshire cave: Stilbella kervillei Lindau, newly recorded in Britain.**—*Journ. of Botany*, lxix, 824, pp. 205–207, 1931.

Dead flies (probably *Blepharoptera serrata* or a nearly allied species) were found in a cave at Cresswell, Derbyshire, bearing the fructifications of an entomogenous fungus identified by Petch as *Stilbella kervillei* (Quél.) Lindau, as well as the immature conidial (*Hymenostilbe*) hair-like filaments of a *Cordyceps*. *S. kervillei* (an emended diagnosis of which is given by Petch) is characterized by synnemata up to 5 mm. in height, terminating in yellow, waxy heads, 0·4 mm. in height and 0·36 μ broad, white, tomentose stalks, branched conidiophores, 20 by 1 μ, and hyaline, catenulate conidia of two types, either oval, measuring 1·5 to 2·5 by 0·75 to 1 μ, or globose, 1·5 μ in diameter. The brown, smooth, subglobose spore-like bodies borne at the apices of short, lateral hyphae arising from the thin crust of mycelium covering the insect measure

5 to 7 by 3 to 5 μ, while the dimensions of the smooth, brown, citriform bodies similarly produced are 7 to 12 by 5 to 7 μ.

Redaelli (P.). **Tecnica micologica medica.** [A technique of medical mycology.]—227 pp., 58 figs., Bologna, L. Cappelli, [1931].

In this work the author gives very detailed instructions for the isolation and study of human and animal pathogenic fungi considered under the following six headings: summarized notes on the morphology and general biology of fungi pathogenic to man and animals; notes on the modern classification of these fungi; special diagnostic technique for separate groups of fungi; pathogenesis and general pathological anatomy; and principal culture media. The book is copiously illustrated, and contains a full bibliography of the subject.

Hufschmitt (G.), Sartory (A.), Sartory (R.), & Meyer (J.). **Un cas de blastomycose cutanée à foyers multiples.** [A case of cutaneous blastomycosis with multiple foci.]—*Ann. de Dermatol.*, Sér. VII, ii, 8, pp. 850–876, 11 figs., 1931.

In connexion with a general discussion on the diagnosis of human blastomycosis, the writers give a full account of a case of this disease in Haut-Rhin, France. The fungus isolated from the pus of lesions on various parts of the body was characterized by budding, yeast-like forms measuring 2·5 to 3 by 3·5 to 4 μ, asci 4 to 12 μ in diameter, and ascospores measuring 2 to 3 μ. The formation of ascospores is associated with the presence of a bacterium in the condensation liquid of solid media, and further occurs on Gorodkowa's medium and plaster blocks. The optimum temperature for the development of the fungus, which was highly pathogenic to mice and slightly so to guinea-pigs, ranged from 27° to 35°, with a minimum below 5° and maximum between 37° and 42°. Glucose and saccharose were fermented. The organism is named *Debaryomyces mucosus* n. sp., its relationships with *D. hudeloi* [*R.A.M.*, viii, p. 103] and Ota's species being shown by means of a table.

Negroni (P.). **Datos estadísticos de 157 casos de micosis humanas estudiados en la ciudad de Buenos Aires. Algunas consideraciones de órden médico.** [Statistical data of 157 cases of human mycosis investigated in the city of Buenos Aires. Some reflections of a medical nature.]—*Folia Biol.*, *1931*, 3–4, pp. 15–18, 1931. [French summary.]

Among the 157 cases of human mycosis investigated in Buenos Aires, the genus *Trichophyton* was represented by 12 species [which are enumerated with the infection percentages and brief clinical details], *Microsporon* by 2, *Epidermophyton* by 3, *Achorion* by 2, *Cryptococcus* by 1 [unidentified], and *Actinomyces* by 2. Other records included pityriasis versicolor due to *Malassezia furfur* [*R.A.M.*, x, p. 312], American blastomycosis (*Coccidioides immitis* and *Mycoderma* [*Blastomyces*] *dermatitidis*) [ibid., vii, pp. 578, 719; ix, p. 652; x, p. 520], and aspergillosis (*Aspergillus fumigatus*).

Fujii (S.). **Über Pompholyx und pompholyxartige Erkrankungen.** [On pompholyx and pompholyx-like diseases.]—*Japanese Journ. of Dermatology*, xxxi, 7, pp. 959–983, 15 figs., 4 graphs, 1931. [Japanese, with German summary on pp. 71–72.]

During the year 1930 the writer invested 240 cases of pompholyx of the feet or, less often, of the hands in and near Tokyo. Twenty-seven strains of *Trichophyton purpureum*, 11 of *T. interdigitale* [*T. mentagrophytes*], and 1 of *T. glabrum* were isolated from the lesions [*R.A.M.*, x, p. 596]. On the feet the fungi under discussion behaved as true parasites, whereas on the hands the lesions were semi-parasitic and semi-idiopathic. The secondary or transitional phase of the disease (trichophytid) was found exclusively on the hands [cf. ibid., x, pp. 313, 522].

Kurotchkin (T. J.) & Chen (F. K.). **Mycological study of tinea of the glabrous skin.**—*Nat. Med. Journ. of China*, xvii, 4–5, pp. 521–528, 6 pl., 1 fig., 1931.

The results of the mycological examination of 100 cases of various mycoses of the glabrous skin conducted at the Peiping Union Medical College clearly indicated that the primary etiological agent was a fungus of the *Epidermophyton* [*Trichophyton*] *rubrum* type [*R.A.M.*, x, pp. 243, 730]. The species generally known as *E. salmoneum*, *E. interdigitale*, *T. purpureum*, *T. rubidum*, and *T. pedis* are regarded by the writers as synonymous with *T. rubrum*. *E. inguinale* [*E. floccosum*: ibid., x, p. 243] was isolated from tinea of the feet in 6 out of 36 cases, but was never found to be associated with tinea cruris, of which it is practically the sole cause in Europe. *T. violaceum* and *Microsporon ferrugineum* [ibid., x, p. 664] were each isolated from four cases of tinea of the body.

Kurotchkin (T. J.) & Ch'in (T. L.). **Tinea of nails in Peiping.**—*Nat. Med. Journ. of China*, xvii, 4–5, pp. 534–540, 6 pl., 1931.

Epidermophyton [*Trichophyton*] *rubrum* [see preceding abstract] was isolated from nine out of thirteen cases of onychomycosis at Peiping, and was also responsible for two cases of leuconychia. Onychomycosis was found to be a secondary infection, apparently from cutaneous mycotic lesions in most of the cases examined.

Chen (F. K.), Kurotchkin (T. J.), & Hu (C. K.). **Tinea favosa in Peiping.**—*Nat. Med. Journ. of China*, xvii, 4–5, pp. 529–533, 4 pl., 1 fig., 1931.

From 18 out of 410 cases of tinea of the scalp among orphanage children at Peiping, the authors isolated a strain of *Achorion schoenleini* [*R.A.M.*, x, p. 664] differing in certain cultural characters from the type species. The colonies were buff-coloured with a glabrous surface or white and covered with a very short duvet; radial rays were formed in the profuse submerged growth and occasionally also on the surface. The fungus is believed to be a new variety [unnamed] of *A. schoenleini*.

PARISH (H. J.) & CRADDOCK (S.). **A ringworm epizootic in mice.**—*Brit. Journ. Exper. Path.*, xii 4, pp. 209–212, 1931.

Details are given of an epizootic of ringworm (*Trichophyton gypseum asteroides*) [*T. mentagrophytes*: *R.A.M.*, x, p. 243] affecting over 1,000 of the entire stock of 2,500 mice at the Wellcome Physiological Research Laboratories, Beckenham, Kent. Laboratory attendants who came into daily contact with the diseased animals became infected and a similar infection was found in two horses belonging to the Laboratory.

AGOSTINI [ANGELA]. **Coniosporium isolé d'un cas d'onychomycose.** [A *Coniosporium* isolated from a case of onychomycosis.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iii, 6, pp. 209–211, 1931.

From an infection of the nails of the hands and feet of an Italian male patient aged 27 years the author isolated a new species of *Coniosporium* which she names *C. onicophylum* Agostini but without a technical diagnosis.

PARIEVSKAYA (Mme A. P.). Мокрая или белая гниль на Льне, вызываемая грибом **Sclerotinia libertiana Fuckel.** [Wet or white rot of Flax caused by the fungus *Sclerotinia libertiana* Fuckel.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 165–170, 6 figs., 1931.

A brief account is given of a severe outbreak of a white rot of flax stems caused by *Sclerotinia libertiana* [*S. sclerotiorum*], similar to that described from Ireland [*R.A.M.*, ii, p. 118], which was observed in 1929 both in experimental plots and in the peasants' fields in the government of Moscow, this being stated to be the first record of the disease in that region. A new feature of the outbreak was the discovery of fruiting apothecia of *S. sclerotiorum* in the fields: these are described as flat, cinnamon-brown bodies borne on cylindrical stipes tapering downwards. The asci are hyaline, cylindrical, 152·9 to 199·4 by 4·3 to 12·4 μ, intermixed with slender paraphyses. The asci contain eight hyaline, ellipsoidal spores, 9·8 to 16·8 by 4·2 to 8·4 μ in diameter. In the field the mycelium of the fungus was very frequently found passing from cruciferous weeds to flax stems in contact with them, this showing the importance of keeping flax fields clear of weeds. In certain localities the percentage of infection was as high as 42, the consequent reduction in the crop being very considerable.

NATALYINA (Mme O.). Предварительное сообщение о болезни Льна, вызываемой грибком **Phlyctaena linicola S.** и обнаруженной на Дальнем Востоке летом **1930** года. [Preliminary report on a Flax disease caused by *Phlyctaena linicola* S., found in the Far East during the summer of 1930.]—*Plant Protection*, Leningrad, viii, 2, pp. 177–183, 3 figs., 1931.

This is a brief account of a disease which was found in 1930 on the grounds of the Nikolsk-Ussuriisk Plant Protection Station attacking flax plants of a variety labelled 'African flax No. 182 with large fruits' which was imported from North Caucasus, but which is believed, on the ground of its botanical characters, to

have originally come from Argentina. The disease corresponded closely to the 'pasmo' disease (*Phlyctaena linicola*) described from America [*R.A.M.*, x, p. 364] both in its symptoms on the host and in the morphological details (save for some minor differences) of the causal organism; a culture of the latter has been sent to Brentzel for final identification. Investigations in the same year showed that the disease was also present on the same variety of flax at the Vladivostock Plant Breeding Institute, where, owing to the favourable climatic conditions, it had already passed to other varieties of flax growing near by. In both localities the disease was causing considerable damage to the foliage and stems, and the importance of taking immediate steps to prevent any further importations of the fungus, hitherto unknown in eastern Asiatic Russia, is emphasized. Preliminary artificial inoculation experiments failed to give positive results, apparently owing to defective technique and to the difficulties which were experienced in inducing the organism to grow in pure culture.

OCFEMIA (G. O.). **Save the Abacá industry from ruin by bunchy-top.**—*Philipp. Agric.*, xx, 3, pp. 167–169, 1931.

The urgent necessity of strict precautions to prevent the further spread of bunchy top of abacá or Manila hemp [*Musa textilis*] in the Philippines is emphasized [*R.A.M.*, ix, p. 785 and next abstract]. The movement of all abacá and banana plants and their near relatives from infected areas to other hemp-growing centres should be prohibited, while a further danger lies in the transference from one place to another of infested soil which may harbour the aphid *Pentalonia nigronervosa*, known to be concerned in the transmission of the disease. Plant materials and other perishable products from the infected areas should not be wrapped in banana leaf sheaths or abacá and banana leaves for shipment to healthy districts, since the insect may be carried on these parts, as well as on the roots and corms. When an outbreak of bunchy top occurs, the entire stools showing symptoms of infection should be eradicated, chopped to pieces *in situ*, and thoroughly sprayed with black leaf 40 or tobacco decoction to kill the infected aphids, the corms being burnt to prevent production of diseased sprouts. Plants to be used in the re-establishment of the abacá industry in the devastated areas should be grown from seed suckers obtained from absolutely healthy districts.

CALINISAN (M. R.). **The occurrence of bunchy-top and root-knot in Abacá.**—*Philipp. Journ. of Agric.*, ii, 2, pp. 121–127, 3 pl., 1931.

Bunchy top and root knot of abacá [*Musa textilis*] are stated to be frequently prevalent together in the Philippines [see preceding abstract], so that at first sight it may be difficult to distinguish between the two diseases. However, an examination of the roots of 27 of the abacá seedlings affected by bunchy top showed no trace of invasion by nematodes. Bunchy top may generally be recognized by the stunted and bunchy growth of the plants, the leaves of which are chlorotic and almost bladeless. In the case of root knot, galls are always present on the roots, the diseased plants

sometimes being stunted, with pale leaves, but not necessarily bunchy.

Rodigin (M. N.) & Papaeva (Nina A.). Корневой рак плодовых деревьев в Нижнем Поволжьи. [Crown gall of fruit trees in the Lower Volga basin.]—*Plant Protection*, Leningrad, vii, 1–3, pp. 113–119, 1931.

Crown gall [*Bacterium tumefaciens*] is stated to have been first recorded in the Lower Volga basin in 1927, almost exclusively on some young pear trees supplied by an important local nursery in Balashoff, where there is evidence that the organism was already present in 1925. As no measures were taken for its control, the disease rapidly gained ground until in 1928 nearly 30 per cent. of the pear and apple planting material reared in this nursery was shown to be infected, with a consequent wide diffusion of crown gall on these hosts throughout the basin. This led to experiments at the nursery for the purpose of eliciting the relative susceptibility of apple varieties [42 of which were tested] to the disease, the results in 1928 and 1929 indicating the existence of wide differences in them in this respect. Thus, ten varieties (including English Pippin and Steinkerke) gave indications of complete resistance under the conditions of the tests, and three (Baboushkino, Skrijapel, and Koritchnevoye Polossatoye [Brown Striped]) showed not more than 1 per cent. infection, while in the remainder infection was more frequent, reaching 30 per cent. in Red Anise. As a general rule, all the resistant varieties are characterized by the high acidity of their sap. The nature of the scion, in these experiments, appeared to have a decisive influence on the resistance or susceptibility of the grafted trees (all of which were worked on the same, relatively susceptible Kitayka stock), the reaction of which to infection was the same as that of the respective scions alone.

The preliminary results of further experiments [very brief details of which are given] indicated that healthy apple cuttings planted close to infected ones could develop typical crown galls in five months. The causal organism is capable of extension inside the host tissues, causing the formation of secondary tumours; infection apparently only takes place through cuts or wounds in the root system. The surgical removal of the galls and subsequent disinfection of the roots with 1 in 1,000 mercuric chloride, 1 in 300 formalin, or 1 per cent. copper sulphate solution did not give practical control. One- and two-year-old trees infected with *Bact. tumefaciens* usually develop as vigorously as uninfected ones, and occasionally show signs of stimulation of growth, but this is not maintained in the following years, and a large proportion of them die before the sixth year.

Harris (R. V.). **The crown-gall disease of nursery stocks. II. The relative susceptibility of Apple stocks to crown-gall. A progress report.**—*Ann. Rept. East Malling Res. Stat. 1928, 1929 and 1930, II Supplement*, pp. 140–142, 2 pl., 1931.

An account is given of experiments begun at East Malling in 1929 in the investigation of crown gall of apple stocks (*Bacterium*

tumefaciens) [*R.A.M.*, iv, p. 221] to determine the relative inherent susceptibility of stocks of the types available at East Malling [ibid., iv, p. 354] by inoculating them with pure cultures of the organism under controlled conditions. Stock no. VII was markedly more susceptible than stock no. I, in regard both to the relative number of successful inoculations and the size of the resultant galls.

JOHNSTONE (K. H.). **Observations on the varietal resistance of the Apple to scab (Venturia inaequalis, Aderh.) with special reference to its physiological aspects.**—*Journ. Pomol. and Hort. Science*, ix, 1, pp. 30–52, 4 pl., 1 diag., 1 graph, 1931.

A full account is given of researches carried out at Long Ashton from 1927 to 1929 on the environmental conditions favouring attack by the apple scab fungus (*Venturia inaequalis*) on different varieties of apple, as well as on the effect of the host on the parasite at the time of penetration and during the subsequent growth of the fungus.

Desiccation, following inadequate wetting, both in the field and under laboratory conditions considerably reduced the germinative power of the spores, this effect being modified, under laboratory conditions, by the nature of the surface on which the spore suspension was placed. Wetting of the organs of the host is modified by varietal peculiarities; protective hairs are present in some young leaves, fruits, and twigs, while a few varieties have water-retaining hairs. Hairs do not appear to determine varietal resistance to *V. inaequalis*, but have a supplementary importance in this respect.

The viability of the spores was affected by the substratum of the lesion producing the spore, by the age of the lesion or culture, the desiccation of the lesion, and by prolonged sub-culturing. The highest germination was obtained from spores found in young lesions on young leaves. Conidia taken from fruits gave poor germination, while those obtained from apparently fresh lesions towards autumn were almost inviable. Spores sown in water from lesions of approximately the same age on leaves of Sweet Alford, Cap of Liberty, an unnamed Cider apple, and the Court Royal varieties, gave, respectively, 90·52, 84·89, 95·21, and 82·7 per cent. germination. The best germination was observed with spores which had just reached maturity. Desiccation appeared to hasten loss of viability; malt agar cultures kept in desiccators for four days gave an average of 47·28 per cent. germination, against 64·99 to 74·01 per cent. in the controls, even though the agar had not completely dried out, while spores from a leaf placed in a desiccator for 24 hours showed a germination reduction from 95·76 to 72·93 per cent. Prolonged sub-culturing not only reduced the number of conidia formed but led to the development of irregularly shaped spores, somewhat resembling the *Cladosporium* type, or even an irregular breaking up of portions of mycelium [*R.A.M.*, x, p. 465].

Evidence was obtained that conidia after culturing showed reduced virulence, and also that different strains may differ in virulence. Some of the strains used appeared to affect certain varieties more than others. It was also found that the organs of

the host pass through a period of maximum susceptibility significantly longer than normal in certain susceptible varieties and in trees deficient in potash or, possibly, calcium.

The actual thickness of the cuticle has no effect on penetration, the fungus being able to pass through even the thickest layers of cuticle on the fruit and petioles of susceptible varieties. Some resistance to penetration was, however, observed in resistant varieties and in the older leaves; this indicates qualitative differences in leaf cuticles. In shoots of Lane's Prince Albert, Crimson King, and King Edward VII the fungus entered the youngest leaf inoculated; in the older leaves a germ-tube and appressorium could be seen, but no penetration had occurred. In the resistant variety Grenadier penetration occurred, but the mycelium appeared to be weak and stained lightly.

JØRSTAD (I.). **Beretning om plantesykdommer i land- og hagebruket. Sprøiteforsøk mot Epleskurv.** [Report on plant diseases in agriculture and horticulture. Spraying experiments against Apple scab.]—Reprinted from *Landbruksdirektørens Beretning*, Tillegg G, 32 pp., 4 diags., 2 graphs, 1931.

The results [which are fully discussed and tabulated] of ten years' spraying experiments against apple scab [*Venturia inaequalis*] in Norway [*R.A.M.*, iii, p. 282] indicated that the most critical times for fungicidal treatment are immediately before and after flowering. The dormant application of lime-sulphur did not give satisfactory results, but summer treatments with it were generally effective and increased the yield by 25 to 30 per cent. when used in conjunction with suitable insecticides. No cases of injury to the leaves or fruit by lime-sulphur were recorded during these trials. The systematic application of Bordeaux mixture gave much better control of scab than lime-sulphur, but caused heavy damage to the Gravenstein and Torstein varieties. In the one test in which it was used sulphur dust gave good results.

MARSH (R. W.). **Apple scab control in the Bristol province: field trials, 1930.**—*Journ. Pomol. and Hort. Science*, ix, 1, pp. 53–72, 4 figs., 1931.

Excellent control of apple scab [*Venturia inaequalis*] was obtained when the trees were sprayed at the 'green flower', 'pink', and 'petal fall' stages, though less effective control resulted when the first spray was applied before the green flower stage.

The exposure of vaselined slides demonstrated that the sole source of infection in the author's experiments during April and May, 1930, consisted in the pustules present on the wood. Over 500 conidia were counted at various times on portions of the different slides, but not a single ascospore was recorded. It is pointed out that the technique employed may have favoured the retention and visibility of the conidia rather than those of the ascospores, while the preceding winter was exceedingly favourable to the complete destruction of fallen leaves. In spite of these circumstances, however, the author considers that the view held in America as to the importance of over-wintered leaves as the source of inoculum [cf. *R.A.M.*, vi, p. 299; x, p. 776] ought not to

be accepted without further examination as necessarily applying equally to Great Britain. Additional evidence pointing to the importance of scabbed wood as a source of primary infection in the spring was frequently obtained in 1930 by noting the proximity of the leaves first scabbed to active scab pustules on the twigs.

At Bridgwater no conidia were caught on the slides until the period 30th April to 15th May; at this centre the buds were at the pink stage on 3rd May. At Yeovil, where the dates for the different stages of bud development were approximately the same as at Bridgwater, no conidia were caught before 12th April, but 53 conidia per sq. in. were recorded in the period 16th April to 5th May. At Hereford, where the trees were about ten days later, 9 conidia per sq. in. were caught between 25th April and 8th May. Thus at Yeovil and Hereford the deposition of conidia was well marked during the fortnight before the buds reached the pink stage, but in none of the centres was there any record of conidia being deposited on the slides until after the 'burst' stage. The recommendation to give the first spray application at or about the green flower stage thus appears to be justified. If spraying is effected before this stage is reached, very few, if any, conidia are falling on to the young leaves, and the amount of leaf surface exposed to the spray is very small. As the leaves expand still further only the tips remain protected by the spray, the rest of the leaf being left liable to infection until the second spray is applied.

MOORE (M. H.). **The effect of meteorological conditions on Apple scab, with special reference to the control of the disease.**—*Ann. Rept. East Malling Res. Stat. 1928, 1929, and 1930, II Supplement,* pp. 157–176, 1931.

The author reviews and discusses the relevant literature describing investigations made elsewhere than at East Malling into the effects of meteorological conditions upon the development of the perithecia and the viability, germination, and dissemination of the spores of *Venturia inaequalis* [see preceding abstract]. The literature dealing with seasonal variations in host susceptibility and the conditions governing the outbreak of scab epidemics is also reviewed, and the paper concludes with a discussion of the practical value of a spraying advisory service based on weather forecasts.

There is a bibliography of 42 titles.

MOORE (M. H.). **Investigations on Coniothecium. A progress report.**—*Ann. Rept. East Malling Res. Stat. 1928, 1929, and 1930, II Supplement*, pp. 150–156, 1 pl., 1931.

After noting the frequency with which the russeting and cracking of apples have been attributed to weather conditions [cf. *R.A.M.*, iv, p. 743; ix, p. 253; x, p. 250], the author states that in October, 1928, his attention was drawn to a crop of Allington Pippins recently picked at East Malling. Prominent star-shaped markings were present on the skin, caused by its being ruptured radially from the lenticels. All the fruits showed the presence of a fungus along the edges of the cracks, the organism

being characterized by a coarse, dark, septate, sparsely branched mycelium and isolated groups of 1- to 4-celled spore-like bodies. The fungus was identified as *Coniothecium chomatosporum* [ibid., x, p. 159].

Apples which have sustained insect injury have invariably, at East Malling, shown the presence of a fungus resembling *C. chomatosporum*, as have apples damaged by Bordeaux mixture or by frost. The author's observations indicate that it is highly probable that this fungus is a facultative parasite.

The author found pustules or blisters on the bark of Cox's Orange Pippin, Stirling Castle, and other varieties, on the surface of which a fungus similar to *C. chomatosporum* was found [ibid., iv, pp. 171, 398].

Work is in progress in an endeavour to identify by cultural methods the fungus constantly associated with these symptoms. In the present study a *Phoma* was found on blistered twigs of Cox's Orange Pippin together with the *Coniothecium*, but no relation was established between the forms in culture. None of the pure cultures of fungi of the *Coniothecium* type gave rise to any other recognized generic form. Preliminary inoculation experiments failed to give any conclusive results.

Late Oregon spray recommendations.—*Better Fruit*, xxv, 10, pp. 5–6, 3 figs., 1931.

Tests conducted in Oregon have demonstrated that perennial canker [*Gloeosporium perennans*: *R.A.M.*, viii, p. 654; x, p. 193] of the trunk and main framework of apple trees can be economically controlled by suitable surgery, wound protection, and the prevention by the use of suitable spray mixtures [the formulae for which are given] of woolly aphis [*Eriosoma lanigerum*] infestation. Fungicides are of no avail against the canker, but rot of the fruit in storage can largely be prevented by spraying the trees with Bordeaux mixture (4–4–50) late in the summer.

To control perennial canker all the affected bark up to a height of six or eight feet should be pared back to sound tissue in early summer. The wounds should be left to heal for 10 to 14 days, after which they should be treated with a mixture of six parts tree paint and one part nicotine sulphate, diluted, if necessary, with petrol and applied, preferably, with a paint gun. The treatment should be repeated annually in June or early July to prevent aphis attack during the rest of the season. Pruning should be deferred until after 15th February, the larger branches being removed and the wounds protected by painting. After the cankers have been cleaned out and painted in early summer further applications of a nicotine sulphate spray may be necessary whenever the woolly aphis reappears.

Horne (A. S.). **Biological work.**—*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1930*, pp. 162–172, 2 graphs, 1931.

Further investigations, in collaboration with Mr. Nitimargi, into the liability of stored apples to fungal attack [*R.A.M.*, ix, p. 657] having shown that infection could be traced to the orchard, the

fungi responsible for diseases in storage varying with the locality, a study was made of the fungal flora of the atmosphere surrounding the trees. The results obtained [which are tabulated and discussed] are based on accurate counts of growths developing on ten plates (area of medium approximately 700 sq. cm.) exposed simultaneously for five minutes, usually on a stand about 10 ft. above the ground.

The total number of organisms, expressed as the number falling per minute on 100 sq. cm., varied in the six different localities tested between July, 1929, and February, 1930, from 1 (Isle of Skye, sea-level) to 176 (Exning, Cambridgeshire). Apples from Exning always show considerable wastage when stored, and many of the fungi caught there are capable of causing fruit rot. Apples from East Malling usually show little wastage, and both total numbers and numbers of pathogenic forms of fungi caught were relatively low in this locality. This difference in degree of wastage was shown to be independent of the natural resistance to infection of apples grown in the two localities.

The experiments with half-apples on the correlation between the rate of fungal invasion and the nitrogen content [loc. cit.] were continued, one hundred Cox's Orange Pippin apples being inoculated on one half with *Fusarium* [*fructigenum*] strain D. The results obtained again showed that the nitrogen values ran parallel with those for radial advance [ibid., ix, p. 42].

Studies (with L. N. Seth) indicated that the changes that take place with age in the resistance of stored apples to fungal invasion are not related to the nitrogen content, but are associated with changes in acidity, sugars, pectic substances, &c. The organisms were grown in synthetic nutrient media in which the concentration of certain important chemical constituents of apples were varied. Nine different fungal strains were tested, and it was found that in *Diaporthe perniciosa*, strain DHF, *Cytosporina ludibunda*, strains CA_4, CC_2, and MK[1], *Phomopsis vexans*, *Fusarium* strains D and A, at all concentrations of glucose the rate of fungal growth fell with increasing acid, while at all concentrations of acid the rate of growth fell with increasing glucose. Using *P. coneglanensis* and *C. ludibunda*, strain CE, it was found that at glucose concentrations of 1·8 to 6 per cent. the rate of fungal growth fell with increasing acid; at glucose concentrations of 9 to 17 per cent. growth fell with increasing acid until a critical concentration was reached, when the rate of growth rose with increasing acid to a second maximum and fell again until growth ceased. At concentrations of acid of 0·025 to 0·21 per cent. the rate of fungal growth fell with increasing glucose; at concentrations of acid of 0·43 to 1·7 per cent. it fell with increasing glucose until a critical concentration was reached, then rising to a second maximum and falling again as before. The acid concentration is known to fall considerably with increasing age of apples, while the sugar concentration falls to a less extent. Acidity is, therefore, regarded as the more important of these two factors in the change of resistance with age. The relation between rate of growth and concentration of acid shown by the two strains *P. coneglanensis* and *C. ludibunda*, strain CE, is of considerable interest in view of

the instances of increase of resistance with age of Cox's Orange Pippin apples previously recorded [ibid., ix, p. 42].

Balakhonoff (P. I.). Квопросу о сортировке урожая. О причинах гнили Яблок в лежке. [The problem of crop grading. The causes of storage rot of Apples.]—*Plant Protection*, Leningrad, viii, 1, pp. 35–37, 1931.

The author states that the recent campaign to revive the fruit exporting industry in the Caucasus has brought to light the highly unsatisfactory situation there as regards the grading of the fruit, as too much is left to the personal factor among the grading personnel. Some graders, who have no strict rules to guide them, pass fruit presenting slight superficial lesions, e.g., small scab spots, healed insect punctures, or light bruises, as fit for long transit, with the result that a very considerable portion of the fruit arrives unmarketable at the place of destination. Thus in 1928 a big shipment of lemons, showing a slight attack by *Ovularia citri* in Novorossisk, developed during transit a severe rot caused by *Penicillium glaucum*, with a final wastage of about 50 per cent. In 1929, a cursory examination of apples passed by the local grader for long distance transport showed the presence at the point of shipment of a conspicuous percentage of heart rot (caused by species of *Monilia, Sphaeropsis, Penicillium*, and *Trichothecium*). Very frequently apples which are apparently quite sound soon develop serious rots when kept for a few days in the laboratory. All these facts show the necessity of unifying the fruit grading service in the Caucasus, and of publishing definite rules for the guidance of the personnel.

In North Caucasus the chief causes of heart rot of apples are stated to be *T. roseum* [*R.A.M.*, x, p. 321] and *Fusarium* (?) *putrefaciens*. Experiments with *M.* [*Sclerotinia*] *fructigena* and *P. glaucum* showed that both fungi very easily attack apples, not only through healed insect wounds and corky spots on their surface, but also through the apparently uninjured cuticle from which the natural waxy coating is rubbed off.

Gourley (J. H.) & Hopkins (E. F.). **Nitrate fertilization and keeping quality of Apple fruits. Chemical, physiological, and storage studies.**—*Ohio Agric. Exper. Stat. Bull.* 479, 66 pp., 5 figs., 9 graphs, 21 diags., 1931.

The results [which are fully discussed and tabulated] of chemical, physiological, and storage studies extending over a number of years in Ohio indicated the complete absence of any correlation between the use of Chilean sodium nitrate as a fertilizer for apple trees and the development of physiological breakdown in storage [*R.A.M.*, ix, p. 114].

Heald (F. D.). **Control of soft scald.**—*Better Fruit*, xxv, 10, p. 12, 1931.

After pointing out that common scald [*R.A.M.*, vii, p. 520; ix, pp. 533, 789] attacks apples of all varieties in cold storage, whereas soft scald [ibid., x, pp. 39, 606] mainly affects the Jonathan and Rome varieties, and stating that the use of oiled wrappers, so

successful in controlling scald [ibid., vi, pp. 102, 301, 622], has been found unavailing to prevent soft scald, the author tabulates some results obtained in January, 1928, from the cleansing of apples with brogdex [ibid., x, p. 452] before placing them in cold storage. Thus, out of one lot of Jonathans 22·5 per cent. of the untreated apples developed soft scald, while none of the brogdexed apples did; in another lot of Jonathans the corresponding figures were 44·4 and 0·95 per cent. Similarly, whereas 6·6 per cent. of a lot of Rome apples, untreated, developed soft scald, none of the treated ones did. In the author's opinion, these figures suggest that the brogdex process is of great value in preventing soft scald in stored apples.

DAVENPORT (A. B.). **Scald of Apples in storage.**—*Better Fruit*, xxv, 10, p. 14, 1931.

The author has found that the following conditions contribute to scald of apples in cold storage [see preceding and next abstracts]: immaturity at picking, delay in placing in cold storage, and loose storage for long periods before packing. The Black Twig, Jonathan, and Rome varieties are the most susceptible, while Newtown, Winesap, and Delicious apples remain unaffected unless stored late in the spring. The three last named have also developed scald badly when packing was deferred until December or later.

A large lot of Bosc pears stored loose showed 80 per cent. scald in February. though other lots in the same room and also stored loose showed little or no injury on the same date. None of the pears in the same house that had been packed earlier in the season showed any scald, and from the evidence available the author concluded that later picking combined with earlier packing in oil wraps would have prevented this wastage.

HARLEY (C. P.) & FISHER (D. F.). **A study of the internal atmosphere of Apples in relation to soft scald.**—*Proc. Amer. Soc. Hort. Sci., 1930*, pp. 271–275, 1931.

Investigations have been proceeding at Wenatchee, Washington State, since 1917 on the factors associated with the development of soft scald in Jonathan and other apple varieties [see preceding abstracts]. In the experiments herein described, Jonathan apples were placed on the day of picking (*a*) in common air-cooled storage at temperatures ranging from about 60° F. in the early part of the season to below 40° in midwinter, and (*b*) in cold storage at 30° to 32°, while a third lot was stored at 70° for varying periods (up to 15 days) before transference to cold storage.

None of the fruit held in common air-cooled storage developed soft scald at any time during the investigations, and very little, if any, was observed among apples transferred to cold storage within 24 hours after picking; a longer delay at 70° resulted in the occurrence of the disease in varying degrees of intensity according to the length of postponement. The maximum severity of soft scald was apparently reached after six days at 70°. It was observed that fruit (Jonathan and Grimes Golden) allowed to remain on the tree for some time after the commercial picking

dates showed a tendency to develop soft scald even on immediate cold storage. Large apples were found to be more liable to soft scald than small ones.

Analyses of the intercellular gases were conducted in connexion with the 1928 experiments, the gases being withdrawn from the tissues at regular intervals (at first daily and subsequently weekly) by a modification of Magness's apparatus (*Bot. Gaz.*, lxx, p. 308, 1920), and analysed in a Bonnier-Mangin apparatus. The intercellular gases of Jonathan apples at the time of picking on 13th September contained an average of 3·8 per cent. carbon dioxide and 16·5 per cent. oxygen. When the fruit was placed immediately at 30° to 32°, the carbon dioxide fell to 3 per cent. on the fourth day, remained fairly constant for two months, and then began slowly to increase, reaching 3·6 per cent. after three months in cold storage. The oxygen increased in cold storage from 16·5 to 19·4 per cent. in four days and remained practically constant throughout the three months of storage. In fruit initially stored at 70° there was an increase of carbon dioxide and a decrease of oxygen, reaching a maximum (9 per cent.) for the former and minimum (15·2 per cent.) for the latter in six days. On transference to a temperature of 30° to 32°, the carbon dioxide percentage fell rapidly and the oxygen content increased, reaching the values of the fruits stored immediately at 32° in about four days. Thereafter practically no difference could be detected in the carbon dioxide and oxygen values between fruit stored immediately and that delayed at 70°.

These results might be thought to indicate that high carbon dioxide concentrations within the tissues at the time of bringing into low temperatures establish the conditions ultimately leading to soft scald. However, in other trials in which apples coated with mixtures of paraffin and mineral oil were subjected to the above treatments, no soft scald developed notwithstanding the high percentages of carbon dioxide and low oxygen content (15·8 per cent. carbon dioxide and 6·1 per cent. oxygen in the delayed fruit, the corresponding figures for the same lots in cold storage being 11·7 and 13·6 per cent. respectively). The presence of high concentrations of carbon dioxide in the tissues cannot, therefore, be regarded as the primary agent in the initiation of soft scald.

Three possibilities of practical control of soft scald in Jonathans may be suggested, namely, (1) common storage at temperatures above 32°; (2) rapid arrest of respiration by the use of carbon dioxide; and (3) immediate storage at 30° to 32°, of which the last is probably the best.

FISHER (D. F.), HARLEY (C. P.), & BROOKS (C.). **The influence of temperature on the development of watercore.**—*Proc. Amer. Soc. Hort. Sci., 1930*, pp. 276–280, 1931.

During July and August, 1926, experiments were conducted at Wenatchee, Washington, to determine the effect of temperature on the incidence of water-core in Winter Banana (susceptible), Gano (non-susceptible), and other apple varieties [*R.A.M.*, x, p. 116]. One lot of each variety was covered with black cambric, a second with transparent cellophane, a third with white cambric, and

a fourth left uncovered. The side of the Winter Banana apples exposed to the sun and covered with black cambric (average temperature of fruit 117° F.) showed 88 per cent. water-core, the corresponding figure for Gano being 63 per cent. The percentages of water-core in the Winter Banana lots covered with cellophane and white cambric, respectively (temperatures 111° and 102°), were 61 and 8, while the uncovered lot (98°) also showed 8 per cent. Severe water-core further occurred in a group of densely shaded green Winter Banana apples exposed to intermittent heating for six days by an electric heater at a distance of about 27 in., while a slight tendency to the disorder was apparent in the fruit at a distance of 36 in. The fruit exposed to this treatment also exhibited various manifestations of heat injury. Similar results were obtained on less mature Winter Banana apples heated for only 48 hours, while in tests on Jonathans beginning on 13th August water-core developed after 24 hours' heating.

Biochemical studies conducted during the last five years indicate that some of the changes occurring in localized tissues and resulting in water-core are analogous to those associated with normal ripening, but they take place at a much more rapid rate. The moisture content of water-cored tissues was found to average about 20 per cent. higher than the normal. The affected tissues were further characterized, in the early stages of the disorder, by their rapid starch conversion and corresponding increase in soluble sugars. The osmotic concentration of the diseased tissues was found to be higher than that of healthy ones. Under certain conditions relatively large quantities of alcohol could be detected (0·1 to 0·8 per cent. by weight of fresh tissue in severely water-cored Delicious apples held at laboratory temperatures for a few days). There was a pronounced decrease of titratable acidity in water-cored as compared with healthy tissue. The evidence accumulated as a result of these studies indicates that water-core is a consequence of premature and unequal starch conversion, which may be induced by the effect of comparatively high temperatures on diastatic activity. The high soluble sugar concentrations developing from this hydrolysis apparently set up abnormal osmotic relationships, leading to the guttation of the affected tissues with water.

READ (F. M.). **Leaf scorch of fruit trees.**—*Journ. Dept. Agric. Victoria*, xxix, 8, pp. 386–387, 2 figs., 1931.

The author states that the 1930–31 vegetative season in Victoria has been marked by exceptionally wet conditions, which are considered to be responsible for the higher prevalence than in normal years of a leaf scorch of deciduous fruit trees, similar to that described by Wallace from England [*R.A.M.*, x, p. 802] and attributed by him to potash deficiency. The scorching develops as a browning and drying out of the margins of the leaves; in bad cases only a small area in the centre remains green, while the remainder is brown and shrivelled, giving the affected trees the appearance of having been severely scorched by fire. This condition was associated in Victoria with the three types of soil mentioned by Wallace, two of which tended to dry during hot spells while the third was water-

logged, but severe injury was also experienced in a locality in which the soil conditions [not further described] did not answer to any of these types. In the author's opinion, the excessive summer rains undoubtedly leached out much potash from the foliage, and thus accentuated the trouble.

It is recommended that, where leaf scorch is appreciable, fairly heavy doses of potash manures should be applied to the trees for three or four years consecutively, or until the trouble disappears. The dressing should be applied preferably towards the end of August each year. On experimental plots at Beaconsfield it was noticed that on trees that had received 3 lb. of sulphate of ammonia scorching was more severe than on those that had received the same dose of potash in addition to nitrogen, while on the plots receiving potash only scorching was practically absent. Clean cultivation had no beneficial effect and, in many instances, was a waste of time.

HARTMAN (H.). **A preliminary report on Anjou scald and its control.**—*Oregon Agric. Exper. Stat. Bull.* 280, 8 pp., 2 figs., 1931.

Anjou scald, the name applied by the writer to a brownish or dark discoloration developing in stored Anjou pears from the Rogue River Valley and elsewhere in Oregon, was first observed in 1928. It appears to be distinct from common pear scald [*R.A.M.*, ix, p. 789], which is characterized by sloughing of the skin and a foul odour of the fruit, both of which features are absent in the present trouble. Anjou scald occurs both in precooled and non-precooled fruit, in frozen pears, in those kept just above freezing point, and in fruit held for varying periods at 29°, 30°, and 31° F., or constantly at 32°. The eating quality of the pears is not materially impaired but their appearance is spoiled. Good control of the disease was obtained under experimental conditions by the use of (*a*) oiled-paper wraps containing 18·2 per cent. oil, and (*b*) copper-oil paper wraps containing 18·1 per cent. oil and 1·4 per cent. copper (equivalent to 5·5 per cent. copper sulphate), as used against *Botrytis* rot.

WORMALD (H.). **Bacterial diseases of stone-fruit trees in Britain. II. Bacterial shoot wilt of Plum trees.**—*Ann. of Appl. Biol.*, xvii, 4, pp. 725–744, 4 pl., 1930.

This is an extended account of the author's researches on the bacterial shoot wilt of plum trees, a preliminary notice of which has already been published [*R.A.M.*, viii, p. 182]. On grafted Victoria plums the disease causes flaccidity and drooping of the terminal leaves of the shoots, many of which show in the early stages of infection elliptical, sunken, dark spots, 2 to 3 mm. in length, with dark centres bordered by a paler zone encircled by a darker line. The lesion then extends, often for several inches, along the shoot. On some shoots the lesions are wholly unilateral and cause a recurving of the apex. Bacterial wilt differs from wither-tip (*Sclerotinia cinerea*) in the development of the lesions directly on the axis and not by extension from the leaves, the

greater length of the spots, and the presence of bacterial masses in the infected areas.

Inoculation experiments were conducted in the greenhouse and out of doors with different strains of the pathogen isolated from naturally and artificially infected shoots. Positive results were obtained on the buds, leaves, fruit, shoots, twigs, and branches of plum trees, but infection developed only round wounds, except in one case where spotting was induced by spraying the leaves with a bacterial suspension. Inoculations on the woody parts usually gave rise to exudations of gum, a fact which suggests that the bacterial wilt organism is a contributory cause of gummosis.

The plum-wilt pathogen, for which the name *Pseudomonas prunicola* is proposed (or *Phytomonas prunicola* if the classification of the Society of American Bacteriologists [ibid., iii, p. 18] is adopted), is a rod with rounded ends measuring 0·9 to 2·5 by 0·3 to 0·5 μ, staining most deeply with methyl violet, carbol fuchsin, gentian violet, and aniline gentian violet, and less vividly with methylene blue, Bismarck brown, and Gram's stain. One, two, or three polar flagella are present. The optimum temperature for the development of the organism appears to be about 25° C. and the thermal death point is 46°. The cultural characters of the plum pathogen on a number of standard media are fully described. When growing in mass on agar slopes or plates the colonies are greyish- or yellowish-white, while on sterilized potato plugs the yellowish tinge is more evident. The organism must, however, be classified among the white organisms, its yellow tint being of a different order from that of the true yellow bacteria, e.g., *Pseudomonas* [*Bacterium*] *pruni*. The plum wilt organism is further briefly compared with, and differentiated from, *Bacillus amylovorus*, *B. spongiosus* [ibid., vii, p. 177], and *P. cerasi* [ibid., iv, p. 488; cf. v, p. 538]. *P. prunicola* liquefies gelatine and coagulates milk, but does not reduce nitrates to nitrites. Its group number is 211·2322033, and its index number according to the description chart of the Society of American Bacteriologists, 5021–31100–0202.

BALAKHONOFF (P. I.). К вопросу о сильном развитии монилнального „ожога" цветов косточковых на Северном Кавказе. [The problem of the severe development of *Monilia* 'scorch' of the blossoms of stone fruit trees in North Caucasus.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 137–139, 1931.

The author states that the severe killing of the blossoms of stone-fruit trees which regularly recurs every year in North Caucasus to such a degree as to render fruit growing unremunerative is almost exclusively due to the highly neglected condition of the local orchards, in which *Sclerotinia cinerea* [*R.A.M.*, x, p. 605] is practically omnipresent. The damage done by this fungus can only be stopped by the usual measures directed towards its suppression, especially during the spring, when the relatively cool and humid conditions favour its luxuriant development. The absence of the fruit rot caused by *S. cinerea* from that region is explained by the weather conditions during the latter part of the season.

Brooks (F. T.) & Brenchley (G. H.). **Silver-leaf disease. VI.** —*Journ. Pomol. and Hort. Science,* ix, 1, pp. 1–29, 2 figs., 1931.

Further investigations into silver leaf disease (*Stereum purpureum*) [*R.A.M.*, x, p. 605], with special reference to its incidence in plum stocks and young nursery trees, showed that the invasion of wounds by the fungus was most satisfactorily prevented by applications of soft grafting wax and home-made white lead paint. Considerable differences in susceptibility to the disease were shown by various derivatives of 'selfed' Victoria plums; inoculation experiments on Victoria plum trees worked on different stocks indicated that the influence of the stock on susceptibility is slight and probably only indirect.

The term 'gum barriers' [ibid., v, p. 502] is now extended to include certain normal reactions of the host below wounds uninvaded by parasitic fungi; these barriers usually develop within an inch of the wound, and require at least two months for their completion. Their formation [which is described] is essentially the same whether *S. purpureum* is present or not, though when the fungus is active they may develop much lower down and more slowly.

Further tests of manurial treatments indicated that no special treatment can be recommended invariably as likely to facilitate recovery. Anything, however, which increases the vigour of affected trees is likely to assist their recovery; in the experiments described phosphatic and potassic manures gave the most beneficial results.

Silvered plum suckers, in which the mycelium of *S. purpureum* was not present, sometimes retained the silvering symptoms up to two years after their separation from the parent trees. In many diseased young worked trees, the fungus had entered through one or other of the wounds made in cutting back the stem of the stock in the process of propagation. The bearing of these investigations on nursery practice is discussed.

In conclusion, it is stated that if a tree does not die during the first few years of infection, its chances of recovery are good. Hot, dry summers assist recovery. The greatest danger of widespread infection occurs when heavy cropping has caused the branches to break, especially if a wet autumn follows.

Natalyina (Mme O.). **Polystigmella ussuriensis nov. gen. et sp.**—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 161–164, 2 figs., 1931.

The author states that in 1928, on overwintered leaves of the local plum *Prunus triflora* var. *coreana* in the neighbourhood of Vladivostock, she found the ascogenous stage of the imperfect pycnidial fungus *Rhodoseptoria ussuriensis* observed in 1912 by Naoumoff (*Bull. Soc. Myc. de France,* xxix, 1913) on the same host, on which it causes a very serious disease of the leaves and fruits, popularly known under the name 'krasnoukha' [measles]. The perfect form is most closely allied to the genus *Polystigma* de Candolle, from which it differs, however, in certain morphological and biological details; it is therefore referred to a new genus

which is named *Polystigmella*, and the name *P. ussuriensis* is suggested for it. The stroma of the perithecial form occupies the whole thickness of the leaf; it is firm, concave on the upper and convex on the under side of the leaf, sharply delimited, rounded, superficially brown, from 1 to 8 mm. in diameter by 280 to 300 μ thick, and with black specks on the under side. The stromata contain numerous applanate loculi (perithecia), 190 to 200 by 150 to 180 μ in diameter, with pigmented ostioles opening on the under surface of the leaves. The asci are hyaline, narrowly club-shaped, on a long, bent pedicel with a thickened heel, and measure 85 to 90 by 10 to 11 μ. Paraphyses are not present. The ascospores are hyaline, two-celled, narrow ellipsoidal, with a transverse septum in the middle, mono- or distichous (eight to each ascus), and measure 8 to 11 by 3 to 5 μ. Russian diagnoses of the new genus and new species are appended.

TOGASHI (K.). **Studies on the pathology of Peach canker.**—*Bull. Imper. Coll. Agric. & Forestry*, Morioka, Japan, xvi, 178 pp., 2 pl., 5 figs., 29 graphs, 1931.

This is a comprehensive discussion, accompanied by 75 tables, of the writer's investigations, dating from 1926, on peach canker in Japan, where the disease is caused by *Leucostoma persoonii* (Nitsch.) comb. nov. (*L. leucostoma* (Pers.) Togashi) and *Valsa japonica* [*R.A.M.*, x, p. 41].

The peach strain of *L. persoonii* was found to be capable of infecting plum, apricot, cherry, and nectarine, while the peach strain of *V. japonica* is pathogenic to peach, cherry, *Prunus mume*, apricot, and nectarine. Generally speaking, the mycelium of these fungi does not reach the xylem, probably owing to the obstructive action of gummy deposits. The formation of wound periderm and callus tissue is much less extensive at the upper and lower edges of the affected area than at the sides. From such unprotected zones the overwintered mycelium invades the adjoining healthy tissues in the spring, so that another canker develops round the margins of that formed the previous year.

The formation of the gum barrier occurs in the embryonic woody tissues immediately after infection by *L. persoonii* and *V. japonica*. Both fungi secrete diastase, invertase, maltase, emulsin, hemicellulase, pectinase, and cellulase, the enzymes of *L. persoonii* being generally more active than those of *V. japonica*. The optimum temperature range for enzymatic activity in *L. persoonii* was found to be 30° to 40° C. and in *V. japonica* 25° to 40°. The process of gummification is believed to be accelerated by the enzymes.

Particulars are given concerning the fluctuations of temperature in the tissues of the north and south sides of peach branches, and of the differences between the temperature of the air and that of the branches. It may be inferred from the data that the tissues on the south side are less resistant to low temperatures than those on the north, this probably being the explanation of the frequent occurrence of sun scald on the southern sides of peach branches. The optimum temperatures for the development of *L. persoonii* are 5° or more higher than those favouring the growth of *V. ja-*

ponica. The former organism, therefore, is more in evidence during warm weather, while the latter assumes a greater relative importance with the onset of colder conditions. *L. persoonii* is widely distributed all over Japan, while *V. japonica* is restricted to the northern part of Honshu and Hokkaido. Some comparative inoculation tests were carried out with a strain of *L. persoonii* and a species of *Cytospora*, both isolated from plum branches in England by Nattrass. The former proved to be a weaker peach parasite than the Japanese strain on the varieties tested, and failed to infect the plum varieties on which it was tried. The *Cytospora* was not parasitic on either host in the author's tests.

The protective reaction of gumming and the healing processes of wound periderm and callus formation were found to depend entirely on the state of growth of the tree and the season of infection. Healing takes place rapidly during the active growth of the trees, which reaches its climax at the end of June.

HARRIS (R. V.). **Notes on diseases of the Raspberry, Loganberry and Blackberry in 1928–1930.**—*Ann. Rept. East Malling Res. Stat. 1928, 1929, and 1930, II Supplement*, pp. 133–139, 1931.

Notes are given on the following diseases of *Rubus* spp. observed at East Malling during the period 1928 to 1930, inclusive: blue stripe wilt (*Verticillium dahliae*) [*R.A.M.*, viii, p. 183], cane spot (*Plectodiscella veneta*) [loc. cit.], spur blight (*Leptosphaeria coniothyrium*) [ibid., ix, pp. 117, 535], *Botrytis* rot (*B. cinerea*), black blotch (? *Cryptosporium minimum*) [ibid., viii, p. 546], *Microthyriella rubi* [loc. cit.], and black root (apparently due to unfavourable soil conditions) of raspberries; cane spot (*P. veneta*) and spur blight (*Didymella applanata*) [ibid., ix, p. 663] of loganberries [*Rubus loganobaccus*]; and *Septoria* spot (? *S. rubi*), rust (*Phragmidium violaceum*) [ibid., iii, p. 428], and purple blotch of blackberries, the last disease being apparently caused by a species of *Septoria* differing from *S. rubi.*

With regard to the raspberry black blotch the author states that in July, 1928, specimen canes received from Leeds were found to be covered with superficial black spots and blotches. *C. minimum* was isolated from the spots and preliminary inoculations indicated that it is weakly parasitic. Later in the year and again in 1930 further similarly infected canes were received from Middlesex and Somerset. There was no evidence that the disease seriously damaged the canes.

SMITH (F. E. V.). **The Banana industry in Portland.**—*Jamaica Gaz.*, liv, 34, pp. 703–704, 1931.

In a letter dated 15th May, 1931, addressed to the Director of Agriculture, the Government Microbiologist reports that both on a recent visit to the Portland banana-growing district of Jamaica, and on a previous visit four months earlier, he was impressed by the rapid degeneration in the banana industry, especially near the coast and within a radius of about eight miles from Port Antonio. Panama disease [*Fusarium cubense*: see above, p. 25] is stated

to be undoubtedly the basic cause of the wholesale abandonment of cultivation in this area by the United Fruit Company. Since the population of the Port Antonio district is largely dependent on the Fruit Company for labour, a serious industrial situation has arisen. In the Swift River Valley and Mount Pleasant the position is somewhat less acute owing to a general move to the higher fresh lands. Since the withdrawal of compulsory treatment in the affected districts the disease may be encountered in all stages, and infection is following the general migration of cultivation to the higher levels, largely owing to the fact that the latter are planted with suckers from heavily diseased plantations. The treatment of all standing disease in the affected area would, in the writer's opinion, involve an unjustifiable expenditure, especially after the Government's outlay of £60,000 in an attempt to save the industry, the failure of which was largely due to the absence of co-operation on the part of the peasantry. The urgent need for a resistant banana is clearly emphasized by the existing conditions in Portland.

Report on a further experimental consignment of Mangosteens from Burma, 1931.—Empire Marketing Board. Experimental Consignments. *Rept.* 10, 8 pp., 1931.

A consignment of 20 boxes of mangosteens [*Garcinia mangostana*], each containing 50 fruits, was shipped from Burma on 2nd April, and reached England on 1st May, 1931. The fruit had been picked at two stages of maturity, i.e., almost ripe and just ripening: in each lot 4 boxes were left untreated, 3 dipped once in rubber latex, and 3 dipped twice in rubber latex. At the time of discharge from the ship the air temperature in the cold store chamber was 50° F. but the flesh temperature of the fruit was 60°, so that the temperature during the voyage may have been somewhat higher than the carrying temperature of 50° to 55° that was recommended.

Wastage was mainly due to a species of *Diplodia* with spores measuring 26 by 14 μ, possibly *D. natalensis* [cf. *R.A.M.*, ix, p. 777], the recognition of which was facilitated by a hardening of the rind of the diseased fruits (probably a secondary effect). Slightly infected mangosteens showed, on cutting, a soft rot of the flesh originating from the stem, while in severe cases the whole fruit was more or less covered by black mould growth. The wastage averaged 48·6 per cent. of the total consignment. Selected mangosteens of the same origin set aside in Burma for canning showed 25 per cent. of wastage when cut, and it is thought probable that at least an equal proportion of the present consignment was affected at the time of shipment. It seems likely, therefore, that *Diplodia* infection originates in the grove and that such sanitary measures as spraying and pruning are necessary to ensure control.

Generally speaking, the latex treatments were effective in preserving the fresh appearance of the fruit and apparently did not cause any increase of wastage. The fruit picked when almost ripe looked more attractive than those just ripening, and were much superior in flavour. The sound fruit sold readily.

TOMKINS (R. G.). **Vaseline and the growth of moulds.**—*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1930*, pp. 68–69, 1931.

Further tests made of the vaseline smearing method of preventing fungal invasion of the cut stalks of fruits and vegetables [*R.A.M.*, ix, p. 729] demonstrated that vaseline has no antiseptic properties, that the rate of lateral fungal spread on an agar surface beneath a continuous film of vaseline is not less rapid than on an uncovered surface, though the amount of mycelium formed is much less, and that strongly growing mycelium can penetrate vaseline barriers in every direction. The effectiveness of vaseline as a preventive of stalk rot appears to depend on the inability of the spores to reach the surface and their failure to germinate owing to lack of direct contact with the surface of the nutrient, and also on the reduction in the initial amounts of mycelium formed whenever germination does occur.

TOMKINS (R. G.). **Volatile substances and the growth of moulds.** —*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1930*, pp. 48–55, 6 graphs, 1931.

Investigations [the results of which are expressed graphically and discussed] into the effect of acetaldehyde upon the growth of *Trichoderma lignorum* [cf. *R.A.M.*, ix, p. 659] showed that the presence of small quantities of acetaldehyde in the atmosphere decreased the rate of growth. The greater the concentration of the acetaldehyde the more was growth retarded, but the rate of growth at any given concentration increased with time, the relative retarding effect of the acetaldehyde being greater in the earlier than in the later phases of growth. When normally growing cultures of *T. lignorum* were introduced into an atmosphere containing acetaldehyde, the rate of growth was immediately checked. Fungal growth was possible in concentrations of acetaldehyde which inhibited germination; the larger the colony the less was the inhibiting effect of a given concentration.

Moulds [unspecified] were able to grow in atmospheres in contact with watery solutions of chloroform if these solutions were not stronger than 5 parts in 10,000 by volume. The presence of chloroform retarded the rate of spread, which remained constant for any given concentration. The rate at which a colony spread when introduced into any given concentration of chloroform was also constant and uninfluenced by the size of the colony.

Ethyl ether, ethyl alcohol, and esters all reduced the rate of growth of moulds. Butyraldehyde retarded growth similarly to acetaldehyde, in so far as germination at a definite concentration was followed by a phase in which there was an increasing rate of growth. The action of formaldehyde, however, was quite distinct from that of other aldehydes, fungal growth continuing at a constant rate in the presence of concentrations which allowed germination.

Volatile substances retarding and inhibiting the growth of moulds appear, thus, to fall into two broad groups, viz., those which when present in definite concentrations retard growth to a constant value, irrespective of the age of the culture and the

duration of exposure, and, secondly, those in whose presence there is a certain measure of adaptation and a consequent increase in the rate of growth with the length of exposure.

DODONOFF (B. A.). К методике полевого испытания инсектофунгицидов. [On the methods of testing insecticides and fungicides in the field.]—*Plant Protection*, Leningrad, viii, 2, pp. 135–148, 3 graphs, 1931. [English summary.]

The author states that in his opinion much of the scientific and practical value of the work hitherto done in testing the efficacy of insecticides and fungicides is vitiated by the lack of uniformity in the methods employed, which precludes the possibility of checking the results of one worker against those obtained by others. This paper represents an effort to arrive at a standardization of the methods used in field tests, two types of which are considered, namely, those on a small scale, which are comparable with laboratory experiments, and those on a large scale, serving to check the results obtained in the first. Emphasis is first laid on the necessity of using more or less uniform dusting or spraying apparatus, since so much of the results depends on their working and on the rate of application of the preparations. Exact formulae are worked out for the estimation of the quantities of dusts and sprays applied, the factors of which include the discharge of the preparation from the nozzles in grams per minute, the width of the dust cloud or spray jet discharged, the dose of the poisonous substance in the dust or spray, and the speed with which the apparatus is moved in metres per minute. It is pointed out that the speed of motion depends on the nature of the crop treated, and that it is important to arrive at a definite average speed in order to render the tests comparable. Mention is made of a dusting apparatus which has recently been constructed and put on the market under the name 'Vek' by the Moscow Branch of the Plant Protection Institute, and which is stated to have given satisfactory results.

VERHOEVEN (W. B. L.). **De ontsmetting van het zaaizaad in den landbouw.** [Seed disinfection in agricultural practice.]—*Tijdschr. over Plantenziekten*, xxxvii, 8, pp. 153–160, 1931.

From the 1,100 replies elicited by a recent questionnaire circulated by the Dutch Plant Protection Service in co-operation with various agricultural societies and individuals, it appears that the disinfection of wheat seed-grain, flax, and sugar beet is now fairly general in all parts of Holland. Less attention is paid to barley, rye, and oats, although in the province of Groningen some progress has been made in this direction. The treatment is usually carried out with an apparatus of the Puk type. Germisan, as officially recommended, was found to be extensively used, but on a number of farms copper sulphate is still employed, and in many cases the methods of treatment are very faulty. Some general observations are made on various aspects of seed disinfection, with special reference to treatment in certain recognized centres whence the seed is distributed to the farmers.

SCHLUMBERGER (O.). **Saatenanerkennung und Pflanzenschutz im Jahre 1930.** [Seed certification and plant protection in the year 1930.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 8, pp. 61–62, 1931.

During 1930 seed certification was refused in Germany on account of disease as follows: 0·8 per cent. of the total area under rye inspected (20,424 hect.) compared with 6 in 1929 [*R.A.M.*, x, p. 47]; wheat (20,804 hect.) 27·2 per cent. (30); barley (10,008 hect.) 26·1 per cent. (45·2); oats (15,884 hect.) 6·9 per cent. (12·2); potatoes (38,113 hect.) including varietal irregularities, 74·7 per cent. (62·9).

Bunt of wheat [*Tilletia caries* and *T. foetens*] was responsible for the rejection of 3 per cent. of the inspected wheat fields, compared with 2·8 in 1929; loose smut of wheat [*Ustilago tritici*] for 0·36 per cent. (0·96); covered and loose smuts of barley (combined) [*U. hordei* and *U. nuda*] for 5·5 per cent. (6·8); and loose smut of oats [*U. avenae*] for 0·6 per cent. (1·2).

Of the potato crop inspected, 3·5 per cent. was rejected for blackleg [*Bacillus phytophthorus*] compared with 5·7 in 1929; 4·2 for *Rhizoctonia* [*Corticium solani*] (2·1); 6·1 for *Phytophthora* [*infestans*] (0·7); 0·7 for the occurrence of wart disease [*Synchytrium endobioticum*] within a prescribed radius (0·8); degeneration and poverty of stand (including virus diseases) 10·9 (23·4); and miscellaneous diseases 5·2 (7).

About 23,874 doppelzentner of the total quantity of seed-grain submitted for certification was treated by the liquid method and 15,804 doppelzentner by the dry.

MONTEMARTINI (L.). **La patogenesi delle malattie delle piante.** [Pathogenesis of plant diseases.]—*Atti III° Congress. Naz. Microbiol.*, Milan, pp. 11–47, 1931.

In this paper the author discusses from many angles and with very numerous references to the relevant literature the problem of pathogenesis in plant diseases, the main points dealt with falling under the following headings: natural host defences against parasitic attack, their break-down by parasites, the active, internal defence set up by attacked organs, and the course and results of the ensuing struggle between host and parasite. The paper terminates with the author's general considerations and conclusions, and there is a 12-page bibliography. [A French version of this paper is given in *Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iii, 7–8, pp. 360–395, 1931.]

PEROTTI (R.). **Les myco-bactérioses.** [Myco-bacterioses.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iii, 6, pp. 209–211, 1931.

This is a version in French of a paper already noticed from another source dealing with the presence of bacteria in fungal infections of oleanders [*Nerium oleander*] and other plants [*R.A.M.*, x, p. 744].

APPEL (O.). **Pflanzenschutz.** [Plant protection.]—*Wissensch. und Landwirtsch.*, pp. 15–22, 1931.

The writer gives a concise outline of the principles of plant

protection, supplemented by data concerning the extent of the losses caused annually in Germany by plant diseases and pests [*R.A.M.*, viii, p. 455]. *Phytophthora infestans* is stated to cause a loss of 15 to 20 per cent. of the potato crop in most years, while in bad years it can reduce the crop to one-third of the normal (e.g., in 1916). The average annual loss from pests and diseases is estimated at 20 per cent. in cereals, 30 per cent. in potatoes, 15 per cent. in sugar beets, 20 per cent. in vegetables, 30 per cent. in fruit, and 40 per cent. in wine. In these crops the total yearly loss averages 18·6 per cent. Taking only 15 per cent. loss this would amount on the known value of the harvest in Germany to RM. 2,000,000,000 annually, and the author considers that it is certainly higher. Direct seasonal and weather damage is excluded from this calculation.

SMITH (J. H.). **Chapter III. Virus diseases of plants.** [*ex* Volume VII of 'A system of bacteriology in relation to medicine'.]—pp. 42–53, London, H.M. Stationery Office, 1931.

This is a brief general survey of existing knowledge on the virus diseases of plants, discussed under the headings of symptoms, transmission, number and specificity of viruses, characters, and etiology.

DALE (H. H.). **Presidential address to the Physiological Section, introducing a discussion on the biological nature of the viruses.**—*Brit. Assoc. for the Advancement of Science*, Centenary Meeting, London, 1931, Section I.—Physiology, 10 pp., 1931.

This is a brief general survey of the biological nature of the viruses, in which the difficulties presented by the definition of the term 'virus' are considered, and the views of those who hold, respectively, that they are organisms, or are transmissible toxins, or belong in part to one class and in part to the other are discussed.

STOREY (H. H.) & MCCLEAN (A. P. D.). **The transmission of streak disease between Maize, Sugar Cane and wild grasses.** —*Ann. of Appl. Biol.*, xvii, 4, pp. 691–719, 4 pl., 1930.

A full account, supplemented by nine tables, is given of the authors' experiments, from 1924 to 1929, on the transmission of streak disease in Natal between maize, sugar-cane, *Digitaria horizontalis*, and *Eleusine indica* [*R.A.M.*, vii, p. 439]. The leaf-hopper *Cicadulina mbila* acted as the sole transmitting agent and was usually manipulated by the single-leaf cage method [ibid., x, p. 652].

The virus of maize streak was found to be incapable of causing permanent infection of sugar-cane, the Uba plants rapidly recovering from the transitory chlorotic symptoms induced, and ceasing to harbour the virus. Uba cane was readily infected by its own virus, which on transference to maize, however, produced only a mild form of streak quite distinct from ordinary maize streak. Repeated passage of the cane virus through maize failed to enhance its virulence towards the latter host. Hoppers carrying the cane virus were able to take up that of maize also.

With considerable difficulty cane streak was experimentally transmitted to P.O.J. 213 from Uba and from P.O.J. 213 naturally infected in the field. Diseased P.O.J. 213 plants frequently gave quite healthy cuttings. Other cane varieties found to be susceptible to streak were Black Tanna, M.P. 55, CH 64/21, Merthi, Oshira, and Kavangire. On the other hand, Co. 205, 210, 213, and 214, Toledo, Hinde's Special, Kassoer, and Kinar did not become infected. The following wild grasses may be added to the 16 previously known to contract streak in the field: *Dactyloteniun aegyptiacum*, *Tragus racemosus*, *Setaria verticillata*, *Rottboellia exaltata*, *Cymbopogon citratus*, and *Diplachne eleusine*.

Streak in *Digitaria horizontalis* was transmitted from the same host and to and from maize, but not from cane. The virus from a naturally diseased *Digitaria* plant, however, was more virulent to cane than the maize virus. *E. indica* could not be infected from maize or Uba cane, but it once contracted mild symptoms from P.O.J. 213. The virus from *Eleusine* itself was only able, in the authors' experiments, to cause temporary infection of the same host.

Under experimental conditions infective leafhoppers survived the winter in the open at Durban and infected maize in the following spring, and it is thought that these insects, rather than perennial host plants, constitute the normal source of the virus for spring infections.

A supplementary table shows the negative results of tests in streak transmission by 21 species of Cicadellids and 4 of Fulgorids.

HOPKINS (J. C. F.). **Some common diseases of Potatoes in Southern Rhodesia.**—*Rhodesia Agric. Journ.*, xxviii, 8, pp. 736–742, 2 pl., 1931.

Brief, popular notes are given on the following fungous and virus diseases of potatoes found in Southern Rhodesia: early blight (*Alternaria solani*), black scurf (*Rhizoctonia* [*Corticium*] *solani*), wilt (*Fusarium culmorum* and a bacterium), tuber rot (*F. solani*), sprain or brown fleck, streak, and crinkle. Three applications of Bordeaux mixture 4–4–50 at about three-weekly intervals have given excellent control of early blight on a commercial scale, often increasing the yield by 100 per cent.

GILLETT (S.), MCDONALD (J.), & ANDERSON (T. J.). **A bulletin on the Potato. Varieties and cultural methods. Diseases. Insect pests.**—*Kenya Dept. of Agric. Bull.* 10 of 1931, 15 pp., 1931.

Notes are given (by J. McDonald) on the following potato diseases occurring in Kenya: early blight (*Alternaria solani*), virus diseases (leaf roll, mosaic, crinkle, curly dwarf, and streak), powdery scab (*Spongospora subterranea*), black scurf (*Hypochnus* [*Corticium*] *solani*, the perfect stage of which was observed for the first time in the Colony at Nairobi in December, 1930), and storage diseases (*Fusarium* spp.). Control measures are briefly indicated.

Virus diseases of the Potato and their control.—*Dept. of Agric. for Scotland Leaflet* 60, 11 pp., 4 pl., 1931.

Notes are given in general terms on the occurrence in Scotland of virus diseases of the potato, which are discussed under the headings of leaf roll, mosaic (severe and mild), perpetuation, transmission, symptomless 'carriers', vigour of stocks, varietal resistance, effect on yield, conditions affecting degeneration, control measures, stock seed, and building up healthy stocks [cf. *R.A.M.*, x, p. 542].

BENSAUDE (MATHILDE). **A degenerescência das Batatas.** [Potato degeneration.]—Reprinted from *Actualidades Biol.*, iv, 61 pp., 17 figs., 1931.

This is a discussion in general terms of the current hypotheses relating to potato degeneration, the diseases associated with which are stated to be very common, though largely overlooked, in Portugal. The phenomenon is considered under the following headings: properties of the viruses; cell inclusions; types of degeneration disease (mosaic, leaf roll, stipple-streak, crinkle, and filosité); classification of the viruses and degeneration diseases [cf. *R.A.M.*, x, p. 746]; losses caused by these diseases; resistance and susceptibility to them among standard potato varieties; direct and indirect influence of soil and climate on potato degeneration; and methods of combating the virus diseases.

BLATTNÝ (C.). **Lze zjistiti přitomnost viru působícího některé choroby Bramborů v jejich přenášeči, mšicích?** [Can the viruses that cause certain Potato diseases be detected in their aphid vectors?]—Reprinted from *Věstn. Král. Čes. Spol. Nauk* [*Trans. Roy. Bohemian Univ. of Sciences*], *1931*, Prague, 2, 7 pp., 1931. [English summary.]

The author states that his microscopical studies of aphids (chiefly *Myzus persicae*) collected from leaf roll, mosaic, and stipple-streak potato plants failed to reveal any marked cytological or histological differences from disease-free parthenogenetic individuals collected on healthy plants and from similar aphids born and bred on the peach [cf. *R.A.M.*, ix, p. 261]. The only difference noted was that while in uninfective individuals the areola around the cell nucleus of the salivary glands is constantly clear, in the majority of the insects collected from diseased potatoes the areola was dark and indistinguishable from the rest of the cytoplasm.

ROCHLIN (EMILIA J.). К анатомии Картофельного растения, пораженного мозаичными заболеваниями. [On the anatomy of the Potato plant affected with mosaic-like diseases]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 145–154, 3 pl., 1931.

This is the original Russian paper by the author on the pathological alterations observed by her in the anatomical structure of potato plants affected with virus diseases, the German translation of which has already been noticed [*R.A.M.*, x, p. 264].

LONGRÉE (KARLA). **Untersuchungen über die Ursache des verschiedenen Verhaltens der Kartoffelsorten gegen Schorf.** [Investigations on the cause of the differing reaction of Potato varieties towards scab.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 3, pp. 285–336, 13 figs., 7 graphs, 1931.

The writer discusses and tabulates the results of her investigations at Dahlem, Berlin, on the causes underlying the differing reaction of some standard potato varieties to scab [*Actinomyces scabies*: *R.A.M.*, x, p. 618].

No correlation was found to exist between varietal reaction and the time of periderm formation in the young tubers, the course of development of the epidermal layers, the final thickness of the cork layers of the skin, or the size and shape of the lenticel surface and the arrangement of the lenticels in the cork layer. There was, however, a connexion between the degree of suberization of the lenticel meristem and varietal reaction to scab, this process generally taking place relatively early in resistant, and late in susceptible varieties. A loose arrangement of the cells of the lenticel above the lenticel meristem was observed only in the susceptible varieties, a rather close one in both groups, and a uniformly dense one with rounded cells exclusively in the resistant varieties. It was also found that the varieties in which the lenticel cells become suberized early are generally resistant. The 'healing' process which occurs in the latter varieties towards the close of tuber growth consists in the shedding of old pustules while no new ones are formed. Susceptible varieties, e g., Allerfrüheste Gelbe, Erstling [Duke of York], and Industrie, were found to be capable of extensive wound periderm formation, whereas in resistant ones, such as Dauerragis, Ackersegen, and Jubel, wound periderm development was only slight.

KÖHLER (E.). **Ueber das Verhalten von Synchytrium endobioticum auf anfälligen und widerstandsfähigen Kartoffelsorten.** [On the behaviour of *Synchytrium endobioticum* on susceptible and resistant Potato varieties.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 3, p. 263–284, 4 pl., 2 figs., 1931.

Pursuing his investigations on the behaviour of the potato wart fungus (*Synchytrium endobioticum*) on susceptible and resistant varieties [*R.A.M.*, x, p. 814], the author differentiates the following infection grades. (I) All or almost all the sori fail to develop. (II) The great majority of sori are abortive, intact ones being found only on the upper infected leaves and portions of the stem. (III) Most of the sori are intact on the upper infected leaves and mid-stem region of the full shoots; conspicuous necroses are restricted to the stem base and lower leaves. (IV) The sori are predominantly intact; extensive necroses are almost entirely confined to the lower leaves. (V) Necroses are barely perceptible, but all or nearly all the sori develop completely.

The mode of infection by the fungus was found to be identical on both resistant and susceptible varieties, the number of successful penetrations also being equal in both cases. The death of the parasite in resistant varieties is a result of necrotic processes

taking place in the host tissue. In very severe infection the whole diseased area dies and forms a dark brown layer over the infected organ. Growing organs gradually shed this layer, of which only traces finally remain. This process, which is termed 'necrogenic abortion', falls into two types, acute and chronic. In the former, occurring only a few hours or days after infection, the invaded host cell itself is the first to decay, whereas in the latter the adjacent cells are first destroyed, leaving the infected host cell to die (with the fungus) at a more advanced stage. A typical wound reaction is generally induced by the necroses.

In addition to necrogenic abortion, the intensity of the hyperplastic reaction of the infected cellular tissues of the host to the presence of the fungus [loc. cit.] plays an important part in resistance or susceptibility.

The varieties belonging to grades (I) to (III) of tolerance are absolutely immune in the field, while those of (III) to (V) are partly immune and partly susceptible.

Lemmerzahl (J.). **Zur Methodik der Krebsprüfung von Kartoffelstämmen.** [On the technique of testing Potato stocks for wart disease.]—*Der Züchter*, iii, 5, pp. 138–152, 8 figs., 1931.

Continuing his attempts at the further simplification of the soil inoculation process for the testing of potato varieties for reaction to wart disease [*Synchytrium endobioticum*: *R.A.M.*, x, p. 335], the writer found that the inoculum retains its virulence for six days, but to ensure complete reliability it should not be used for more than four, while the time of inoculation should not be less than four hours. The omission of a vaseline ring from around the eyes that were to be inoculated did not prevent successful infection by zoospores, provided the inoculations were performed in a moist chamber, but no saving of labour was thereby effected. A temperature range of 10° to 20° C. was found to be suitable for inoculation. The warts used as inoculum should be two, four, or more weeks old; the use of material three weeks old should be avoided as mature zoospores are not usually present. The inoculum should be derived from varieties showing a high degree of susceptibility and a pronounced reaction [see preceding abstract]. In order to test the possibilities of beginning the inoculations immediately after the harvest, experiments were carried out on freshly collected tubers, with positive results in 80 per cent. of the cases.

Dorogin (G. N.). **Инструкция учреждениям и лицам, работающим с сортовым Картофелем по проведению мер для предупреждения заноса и распространения у нас рака Картофеля.** [Instructions to institutions and persons working with Potato varieties in regard to the measures to be taken for the prevention of the introduction and spread in our country of the Potato wart disease.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 57–61, 3 figs., 1931.

After giving a very brief description of the morphology and biology of *Synchytrium endobioticum* (which is stated to be so far absent from the Union of Soviet Republics), the author gives

a few recommendations for the careful phytopathological examination of all potato varieties imported from abroad, especially from Germany. It is pointed out that some of the 'resistant' varieties, e.g., Jubel, originating from that country are particularly dangerous, inasmuch as they frequently bear small, inconspicuous lesions which may be easily overlooked, and can only be detected under the microscope or by inoculation tests. In the case of the accidental introduction of the wart disease into any locality, drastic steps should immediately be taken for its complete eradication, including the thorough removal from the soil of all parts of the diseased plants and their destruction by fire, the isolation of the infection foci with a margin not under 2 m. all around, the disinfection of the ground under the infected stools with fungicides, and keeping such spots under clean fallow for ten years at least.

KÖCK (G.). **Über das Verhalten der verschiedenen Kartoffelsorten gegenüber dem Erreger der Kartoffelknollenfäule (Phytophthora infestans).** [On the reaction of different Potato varieties to the causal organism of Potato tuber rot (*Phytophthora infestans*).]—*Fortschr. der Landw.*, vi, 16, pp. 518–522, 3 figs., 1931.

The writer discusses and tabulates the results of his inoculations in Vienna of cut disks of 80 potato varieties in order to test their reaction to the tuber rot caused by *Phytophthora infestans*. The varieties are placed in five different categories based on the classification of Jones and his collaborators (*U.S. Dept. Agric. Bureau of Plant Indus. Bull.* 245, 1912), viz., (1) highly resistant, (2) moderately resistant, (3) intermediate, (4) fairly susceptible, and (5) very susceptible. Group (1) includes Topas, Marius, and Klondyke; (2) Rubinkipfler, Regent, Gloria Juni, Exquisite, Malta, Rotkaragis, and Edzell's Blue; (3) *Solanum commersonii*, Industrieperle, Beseler, Paulsen's Juli, Wohltmann, and six others; (4) Cellini, Blücher, Evergood, Berlichingen, Graf Dohna, Erdgold, Triumph, and 16 others; (5) Goldball, Silesia, Pirola, Preussen, Hindenburg, Goldappel, Odenwälder Blaue, Kipfler, Ackersegen, Jubel, Parnassia, Deodara, Dauerragis, and 23 others.

An examination on the ninth day after inoculation showed considerable varietal differences in the extent of sporangial formation, but no correlation could be detected between this character and vigorous mycelial growth. In cultures with profuse mycelial development the hyphae were mostly straight and little branched, whereas in cultures of scanty growth they were much twisted, with a strikingly gnarled appearance and numerous short branches. The latter may be characterized as 'inhibition' or 'starvation' forms, their peculiar type of growth being apparently due to some inhibiting factor in the host. No connexion could be traced between hydrogen-ion concentration and the extent of mycelial development.

TENGWALL (T. A.). **Topinsterving bij oculatie-uitloopers.** [Top die-back of bud shoots.]—*De Bergcultures*, v, p. 34, pp. 916–917, 3 figs., 1931.

A brief note is given on the *Phytophthora* infection of *Hevea*

rubber buddings in Java, the symptoms of which have already been described [*R.A.M.*, ix, p. 267]. Another form of die-back of bud shoots, in which *Phytophthora* does not seem to be involved, has recently been observed. The disease occurs chiefly on the shoots from buds on heavy stocks with a well-developed root system, but it has also been observed on bud shoots on $1\frac{1}{2}$-year-old stocks. The tips of the shoots may wither before they have put out leaves or after they have begun to branch. Cases of top die-back have been investigated in shoots developing on the upper part of five-year-old bud scions lopped to a height of about 2 m. owing to the breaking off of a branch.

REYDON (G. A.). **Over de meest in Besoeki voorkomende wortelschimmels bij Rubber en Koffie.** [On the root fungi most prevalent in Besoeki on Rubber and Coffee.]—*De Bergcultures*, v, 33, pp. 892–897, 899–900, 902–909, 1931.

Rubber in the Besoeki district of Java is liable to infection by three root fungi, viz., white (*Rigidoporus microporus*) [*Fomes lignosus*], brown (*F. lamaoensis*), and red (*Ganoderma pseudoferreum*) [*R.A.M.*, viii, p. 202; x, p. 405], the last-named, however, being of rare occurrence. Both in East Java and along the east coast of Sumatra, a high proportion of trees attacked by *F. lignosus* (50 to 75 per cent.) recover spontaneously. In *G. pseudoferreum* natural recovery has been observed in some 20 per cent. of infected young trees and in more than half the old ones as a result of improved drainage. On the other hand, *F. lamaoensis* destroys its hosts, namely, rubber, coffee, lamtoro [*Leucaena glauca*], and dadap [*Erythrina lithosperma*], within a few months.

Coffee suffers most severely from the attacks of *F. lamaoensis*, which has been found to spread from the stumps of jungle trees, especially *Artocarpus* sp., left in the plantation after clearing operations. Inoculation experiments by s'Jacob with coffee and *L. glauca* roots bearing *F. lamaoensis* resulted in the rapid infection of rubber. The author's own inoculations on *Hevea* seedlings with the white mycelial strands removed from infected *Hevea* roots gave negative results, the strands dying out after a time. The white and red root fungi may be successfully combated by means of isolation trenches three feet deep, and the opening up of the diseased roots which are then excised and burnt, the wounds being disinfected with 20 per cent. carbolineum or 10 per cent. izal, but in the case of the brown root fungus the prophylactic eradication of the infected tree stumps is necessary. The estimated cost of the former treatment apart from the trenching [full details of which are given, together with notes on other methods still in the experimental stage] is 30 cents to Fl. 4 per tree.

BRONSART (H. v.). **Bodenmüdigkeit, ihre Ursachen und Bekämpfung.** [Soil sickness, its causes and control.]—Reprinted from *Wissensch. und Technik des Gartenbaues*, i, 83 pp., 1 fig., 2 diags., 5 graphs, 1931.

This is a discussion, based on personal observations as well as on a survey of the relevant literature, on the problem of 'soil sickness', with special reference to German conditions. The sub-

ject is considered mainly from the chemical standpoint. The influence of various methods of partial sterilization is discussed at some length.

A bibliography of 102 titles is appended.

RYAKHOVSKY (N.). Определитель грибных болезней Аниса и Кориандра. [Key to the fungal diseases of Anise and Coriander.]—*Plant Protection*, Leningrad, viii, 2, pp. 185–186, 1931.

This list of parasitic fungi attacking aniseed [*Pimpinella anisum*] and coriander [*Coriandrum sativum*] plants in Russia is stated to have been compiled from scattered notes in literature, with the exception of *Cercospora coriandri* Sacz. [? Jacz.] on coriander, which is recorded as a new species; it is characterized by conidia 30 to 75 by 3 to 5 μ in diameter, with one or two faintly discernible septa. The other diseases on coriander are those caused by *Protomyces macrosporus*, forming hard, corn-like swellings, from 9 to 11 by up to 3 mm. in diameter, on the stems, petioles, and leaves, later liberating globular or ellipsoidal chlamydospores, 40 to 80 by 35 to 60 μ, with a thick, yellowish wall and hyaline contents, and the rust due to *Puccinia petroselini*. The diseases of aniseed mentioned are those caused by *Plasmopara nivea* (downy mildew) [*R.A.M.*, x, p. 775], *Cercospora malkoffii* Bub., and the rust *Puccinia pimpinellae*.

CHRISTOFF (A.). Бактериозата по кутлурния Макъ. [A bacterial blight of the Opium Poppy.]—*Renseignements Agricoles* [? Sofia], xii, 1–2, pp. 27–46, 2 pl., 1931. [English summary.]

This is a detailed account of a bacterial disease of the opium poppy (*Papaver somniferum*) found in two localities in Bulgaria, doing considerable damage to the crop. The symptoms [which are fully described] are both of a local and systemic nature, and inoculation experiments showed that the causal organism may gain entry into the host tissues both through the stomata and the water pores; in the latter case, the bacteria penetrate the vascular system, where they develop in enormous numbers and spread to all the organs of the plant, including the seeds which are variously discoloured and misshapen. The morphological and cultural characters of the organism, except for a few minor differences, are very similar to those of *Bacterium papavericola* recently described from the United States [*R.A.M.*, ix, p. 456], with which it is provisionally considered to be identical. Its pathogenicity to the opium poppy and to the oriental poppy (*P. orientale*) was proved by successful inoculations.

The chief source of infection appears to be the seed, and it is recommended to use exclusively seed from healthy plants.

STEVENS (F. L.) & ATIENZA (J. D.). **Diseases of cultivated Ginger.**—*Philipp. Agric.*, xx, 3, pp. 171–176, 4 figs., 1931.

Cultivated ginger (*Zingiber officinale*) in the Philippine Islands suffers severe damage from a disease characterized by irregularly oblong, snow-white spots on the leaves, 150 by 225 μ in diameter and surrounded by a water soaked zone 75 to 100 μ wide. As the

spots enlarge numerous pycnidia develop in the centre, which becomes very ragged and torn. In the final stages two-thirds or more of a leaf may be involved by the coalescence of individual spots. The causal organism, to which the name of *Coniothyrium zingiberi* Stevens and Atienza sp. nov. is given, is characterized by circular, subglobose, dark yellow to black, reticulate pycnidia, 40 to 125 μ in diameter, with a clearly defined circular ostiole, 7 μ in diameter, and pale yellow, continuous, ovoid, often biguttulate spores, 3·5 to 4 by 7 to 10 μ. In culture the pycnidia are distinctly rostrate, the rostrum measuring 25 μ in width and 17 μ in height. Inoculation experiments with spore suspensions and mycelial fragments on healthy leaves gave positive results.

A dry, black rot of ginger rhizomes is common, especially on those on or near the ground at the bottom of a pile. The older portions of rotting rhizomes bear on the surface immense numbers of globose, black perithecia, 1,500 to 1,800 μ in diameter, covered with irregular or conical projections about 70 μ high and 120 μ at the base. The interior of the rhizome in these places is rotted away to a mere shell enclosing the vascular framework. In the earlier stages a white, superficial mycelium occurs on the surface of the rhizome, the vascular strands of which are heavily darkened and infected. The causal organism, *Rosellinia zingiberi* Stevens and Atienza sp. nov., is characterized by continuous, multiguttulate, black ascospores, 60 to 70 by 7 μ, with slender awns at each end, 18 μ in length, borne in very thin-walled, hyaline, almost invisible asci, 255 by 30 μ, accompanied by numerous filiform paraphyses. The spores of *R. zingiberi* are much larger than those of *R. gigaspora* though smaller than those of *R. macrosperma*; it differs from *R. emergens* var. *bambusicola* in its larger perithecia and in the shape and thickness of the spores, while the awns constitute a further distinguishing feature.

Red rhizome rot, occurring under similar conditions to those mentioned above, may be readily differentiated by the presence of numerous superficial, bright red, globose, rostrate, ostiolate perithecia, with an irregularly verrucose surface, 210 to 240 μ in diameter. The red mycelium and resulting decay do not penetrate far into the rhizome (3 or 4 mm.). The causal organism, *Nectriella zingiberi* Stevens and Atienza sp. nov., is characterized by very thin-walled asci, 70 by 7 to 10 μ, and hyaline, oblong, unicellular, inordinate ascospores, 10 to 11 by 4 μ. A *Nectriella* on the same host agreeing in perithecial, ascus, and ascospore dimensions with the foregoing but differing from it in the almost complete absence of colour in the perithecia and their occurrence in dense clumps, is considered to constitute a distinct variety and is named var. *pallida*.

VIDAL (L. F.). **El mosaico de la Caña de Azucar.** [Sugar Cane mosaic.]—44 pp., Tipografia Cervantes, San P. de Macoris, Dominican Republic, 1931. [Abs. in *Facts about Sugar*, xxvi, 11, p. 503, 1931.]

Notes are given on the etiology and mode of dissemination of sugar-cane mosaic, methods of control, resistant or immune varieties, and other aspects of the disease. The book is profusely illustrated with photographic reproductions.

McIntosh (A. E. S.). **Report of the Geneticist.**—*Ann. Rept. Dept. of Agric. Barbados for the year 1930–31*, pp. 22–53, 6 diags., 1931.

Symptoms suspected to be those of gumming disease (*Bacterium vascularum*) were first observed in Barbados on the leaves of the Ba. 11569 sugar-cane variety about July, 1929, in the parish of St. Lucy. This diagnosis was later confirmed by Prof. Briton-Jones of the Imperial College of Tropical Agriculture, Trinidad. During the crop season of 1930, no definite cases of gum exudations were recorded in spite of the spread of the 'mild' form of the disease (in which the symptoms are confined to the foliage) over a large part of the island. No diminution of yield appears to be caused by this form of gumming. The results of a test to determine the relative resistance of different varieties to *Bact. vascularum* indicated that Uba, P.O.J. 213, P.O.J. 36, and probably P.O.J. 2364 do not suffer from this disease; B.H. 10 (12), B. 891, B. 417, Co. 213, and B. 391 are highly resistant; while Ba. 11569, Ba. 6032, B. 381, and B. 663 are very susceptible [cf. *R.A.M.*, ix, p. 680 *et passim*].

Abbott (E. P.). **Red rot of Louisiana Sugar Canes.**—*Sugar Bull.*, 1st October, 1931. [Abs. in *Facts about Sugar*, xxvi, 11, p. 502, 1931.]

As determined by artificial laboratory and field inoculations the order of susceptibility to red rot [*Colletotrichum falcatum*] of the chief sugar-cane varieties used in Louisiana is as follows in ascending order: C.P. 807, P.O.J. 213, P.O.J. 36 and 36 M., Co. 281, and P.O.J. 234. Under natural field conditions the first-named variety appears to be highly resistant.

Melhus (I. E.). **The presence of mycelium and oospores of certain downy mildews in the seeds of their hosts.**—*Iowa State Coll. Journ. of Sci.*, v, 4, pp. 185–188, 2 figs., 1931.

Mycelium of *Peronospora alsinearum*, collected in the spring of 1915 on *Cerastium viscosum* in Virginia, was present in the walls of the ovary and seed [cf. *R.A.M.*, ix, p. 426]. Part of the pod and the central placenta contained numerous oospores and mycelium. Some seeds were normal, while others in the same pod contained many oospores, 13 of which were detected in a single section.

In 1912 the Wisconsin pea crop was generally infected by *P. viciae* [ibid., ix, p. 274], the mycelium of which attacks the developing pod, causing enlargement and discoloration of the ovaries, while a few of the seeds fail to mature. No trace of the fungus was detected on the surface of the seed or the inner side of the ovary walls, but on sectioning the seed mycelium was commonly found in the intercellular spaces of the seed coat.

Cystopus bliti was unusually prevalent on *Amaranthus retroflexus* at Ames, Iowa, in the spring and autumn of 1920, causing a reddish or light brown discoloration of the normally green flowers, accompanied by hypertrophy and distortion of the flowers and stems. Mycelium and mature oospores of the fungus were found in the floral bracts, ovary walls, and within the seed coat.

KARPOVA-BENOIS (Mme E. I.). Грибы сем. **Thelephoraceae, собранные в Московской губернии в 1926 году.** [Fungi of the family Thelephoraceae collected in 1926 in the government of Moscow.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 77–113, 24 figs., 1931.

In this paper the author gives full macroscopical and microscopical descriptions of 31 species of fungi belonging to ten genera of the Thelephoraceae, which she collected in the government of Moscow in 1926. Several of the species included are well-known parasites of cultivated and forest trees. All the figures illustrating this paper are original.

MANDELSON (L. F.). **Tobacco diseases.**—*Queensland Agric. Journ.*, xxxvi, 2, pp. 213–233, 5 pl., 1931.

Brief popular notes [illustrated by useful large-scale photographs] are given on the symptoms, causal organisms, hosts, conditions predisposing to, and control of the following tobacco diseases known to occur in Queensland, viz., blue mould (*Peronospora* sp.) [*R.A.M.*, x, p. 134], mosaic, black root rot (*Thielavia basicola*), and frog eye (*Cercospora nicotianae*) [ibid., ix, p. 140], as well as on various other tobacco diseases not yet recorded there.

STOREY (H. H.). **A new virus disease of the Tobacco plant.**—*Nature*, cxxviii, 3222, pp. 187–188, 1931.

The writer has recently investigated at Amani, Tanganyika, a tobacco disease characterized by leafy outgrowths from the veins on the lower leaf surfaces, sometimes up to 1 cm. wide, but usually amounting to no more than a dark green thickening of sections of the veins. The whole plant is stunted and the leaves are twisted and curled. No trace of chlorosis or necrosis has been observed.

The disease has been successfully transmitted to healthy tobacco plants by grafting diseased scions on to them, and also by means of an undetermined species of whitefly (Aleurodidae) collected on diseased plants. These experiments under controlled conditions, together with the absence of a visible parasite, would appear to justify the inclusion of the disease in the virus group.

A condition of the tobacco plant in which the leaves are curled has been reported to occur in many parts of South and East Africa, but it is uncertain whether this is due to the same cause as the Amani disease. Two types have been recognized in South Africa, viz., 'curly leaf', an hereditary abnormality, and 'crinkly dwarf', of unknown origin (*Rept. Proc. Pan-African Agric. & Veter. Conf.* Pretoria, 1929, p. 31), the latter agreeing well with the symptoms observed at Amani.

TVERSKOY (D. L.). **Бактериальная пятнистость Табака и Махорки.** [Bacterial spotting of Tobacco and Indian Tobacco.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 125–132, 3 figs., 1931.

The author states that his isolations from numerous samples of *Nicotiana tabacum* and *N. rustica* showing bacterial spotting of the leaves from Crimea and North Caucasus yielded practically in every case an organism which, except for some minor differences,

is very similar both morphologically and culturally to *Bacterium tabacum* [*R.A.M.*, x, p. 627]. Inoculation experiments proved the pathogenicity of the bacterium to both species of tobacco, and also to tomato and clover. One experiment in the greenhouse indicated that the formation of concentric rings in the spots is due to the alternation of periods of low atmospheric moisture and high temperature, which completely arrest the development of the bacteria, with periods of high moisture and low temperature which further it.

GHIMPU (V.). **Alternarioza Tutunurilor și combaterea ei.** [Alternariosis of Tobacco and its control.]—Reprinted from *Bul. Cultivarei și Fermentarei Tutunului*, Bucarest, xx, 1, 28 pp., 2 pl., 7 figs., 1931. [French summary.]

This is a detailed account of the author's investigation of a very severe leaf spotting of tobacco which did considerable damage to the crop in July and August, 1930, over practically the whole of the tobacco-growing regions of Rumania. The spots were caused by the conidial stage (*Alternaria tenuis*) [*R.A.M.*, vii, p. 765] of *Pleospora alternariae*, the perithecia of which were found on dead tobacco leaves; these are somewhat sunken in the host tissues, dark, hard, globular, with an ostiole surrounded by a few characteristic bristles. Each perithecium contains two or three almost ovoid, hyaline asci, measuring on the average 74 by 34 μ, and including eight hyaline, oval, pluriseptate (5 transverse and one to several longitudinal walls) spores, 30 by 13 μ in diameter.

In giving a full description of the development of the disease in the field, the author states that this serious outbreak was undoubtedly caused by the abnormal heat of the summer months of 1930, broken by heavy rain storms, a combination of conditions which weakened the tobacco plants and was very favourable for the development of the fungus. This view is supported by the fact that *A. tenuis* is extremely widespread both in the air and the soil, and that every year it may be found on tobacco seedlings and young transplants in the spring, without doing, however, any appreciable damage to the crop. This leads him to question whether the fungus was really the primary cause of the disease, although he was able to reproduce it in a mild form in laboratory inoculation experiments.

Since the seed from diseased plants was shown to carry large numbers of spores of *A. tenuis*, and in view of the seriousness of the losses caused by the disease in 1930, it is recommended that the seed should be disinfected before sowing. Most of the usual fungicides which were tested proved to be either ineffective against the fungus or toxic to the seed, but relatively good results were obtained by steeping the seed for 15 minutes in a 1 per cent. silver nitrate solution, or mixing it with potassium bichromate (1 gm. to 1 kg. seed) or ceresan (10 gm. to 1 kg.). The importance is also stressed of thoroughly disinfecting the seed-beds, and of taking the usual sanitary precautions in the tobacco fields, such as immediate removal and burning of all diseased leaves and plant débris, and spraying the plants with fungicidal mixtures. Although all the varieties of tobacco commonly cultivated in Rumania were

equally attacked, two late maturing Italian varieties suffered relatively little from the epidemic, and this fact may be made use of in the development of resistant varieties.

SAMUEL (G.) & BALD (J. G.). **Thrips tabaci as a vector of plant virus disease.**—*Nature*, cxxviii, 3229, p. 494, 1931.

The authors now confirm the earlier work of Pittman and also that of K. M. Smith in finding that *Thrips tabaci* is capable of transmitting spotted wilt of tomato [*R.A.M.*, x, pp. 65, 694], but state that *Frankliniella insularis* appears to be a more efficient vector. They have further found that the latter can only transmit in the larval stage, as is also the case with the transmission of pineapple yellow spot by *T. tabaci* in Hawaii, according to verbal information received from Linford [ibid., x, p. 474].

RAMSEY (G. B.) & BAILEY (ALICE A.). **Tomato late-blight rot, a serious transit and market disease.**—*U.S. Dept. of Agric. Circ.* 169, 10 pp., 6 figs., 1931.

After giving a brief account of the disease of tomatoes caused by a fungus believed to be identical with, or very closely related to, *Phytophthora infestans* in the United States [*R.A.M.*, viii, pp. 24, 140], the authors discuss at some length its economic importance in years of abundant atmospheric moisture (fogs or rains) with cool nights and moderately warm days. Besides the losses in the field, the disease is responsible for serious wastage during transit and marketing. Tomato fruits are susceptible to decay by the fungus during all stages of their development, the rot starting in practically all instances at the stem scar, and about five days being usually required for the decay to become visible. Infections through wounds elsewhere on the fruit produce visible decay much sooner. Tomatoes harvested from diseased fields but showing no decay at the time of shipment may develop spots varying from 1 to 1½ inches in diameter during a six-day transit period. Spread in transit from diseased to healthy fruits is rare. A measure of control of the transit rot may be attained by immersing the tomatoes immediately after harvesting in a 1 in 300 solution of formaldehyde for two minutes, and then allowing them to stand for four or five days before packing, but this treatment requires an expensive equipment, which renders it impracticable for most tomato-growing regions. In the field the disease is best amenable to control by the use of 4–4–50 Bordeaux mixture or by cupric dusts.

VANINE (S. I.). Курс лесной Фитопатологии. Часть I. Болезни и повреждения вызываемые грибами. [Lectures on forest pathology. Part I. Diseases and injuries caused by fungi.]—326 pp., 159 figs., Госуд. С.-хозяйств. Издат. [State Agric. Publications Office], Moscow and Leningrad, 1931.

This useful and copiously illustrated publication is primarily designed to be a text-book for Russian students of forest pathology. It deals with the fungal diseases of trees and the timber decays caused by fungi which are of economic importance and are known

to occur on the territory of the Union of Russian Republics. Control measures, where applicable, are discussed under each disease. A list of the diseases arranged by their hosts and a list of alternate hosts for the rusts dangerous to trees are given at the end of the volume, and the bibliography appended occupies 18 pages.

HAMOND (J. B.). **Some diseases of Walnuts.**—*Ann. Rept. East Malling Res. Stat. 1928, 1929 and 1930, II Supplement*, pp. 143–149, 1931.

The first leaves of walnut trees attacked in the spring by bacterial blight (*Pseudomonas* [*Bacterium*] *juglandis*) [*R.A.M.*, ix, p. 567; x, p. 495] at East Malling do not show typical spotting, but are contorted and with spots at the margins only. Infection was successfully caused from such leaves by placing a healthy seedling walnut under them in a cool greenhouse and spraying them with water. Infection was most pronounced on leaflets directly under the contorted ones and it is concluded that under natural conditions the bacteria are washed from leaf to leaf by rain. The source of initial infection each spring is thought to lie in the diseased shoots. In February, 1929, all the old lesions were cut out while the (nursery) trees were still dormant, but this did not prevent subsequent leaf infection. In several instances all the leaves from a single bud were attacked as they unfolded, while leaves from other buds on the same tree were clean at this stage. This suggests that *Bact. juglandis* may overwinter in the bud scales as well as in old stem lesions. It was isolated from stem lesions throughout the period from January to March. Inoculation tests demonstrated that *Bact. juglandis* readily infects young shoots through wounds such as are caused in nurseries by the string used for tying the plants to supports.

In the autumn of 1929, walnut leaves thickly covered with the conidia of *Marssonia* [*Marssonina*] *juglandis* [ibid., viii, pp. 322, 614] were placed in an exposed box, and in the following March abundant perithecia of *Gnomonia leptostyla* were present. The ascospores reinfect the young leaves in spring, giving rise to the conidial stage, *M. juglandis*.

In 1930 several walnut trees were seen on which one or more shoots had died back, the trouble affecting old-established trees, seedling trees planted out, and young grafted trees. Some of the last-named had died back almost to the junction between stock and scion. The dead shoots showed the presence of *Cytospora juglandina* and the *Phomopsis* stage of *Diaporthe perniciosa*.

In the spring of 1930 many walnut trees grafted under glass failed to form a union between the stock and the scion, and the cut surfaces in some cases bore dark brown, powdery, circular or irregularly shaped, very thick-walled fungal spores about 15 μ in diameter. The cells in the dead areas, particularly of the medullary rays, were packed with thick-walled hyphae, while fine hyphal threads also ran through the living cells. In pure culture the dark, spore-like bodies were found to be formed directly from hyphal cells and they are considered to be chlamydospores. Small,

hyaline, rod-shaped, endogenously-formed conidia also developed in these cultures. When the fungus was inoculated into young seedling and grafted walnut trees, the characteristic dark spores were produced. The fungus was determined as belonging to the genus *Chalaropsis*, and Peyronel, who examined a culture, considered it to be identical with *C. thielavioides*, parasitic on lupins in Italy [ibid., vii, p. 582].

A list of fungi found on the shells of stored walnuts at East Malling, including *Botrytis cinerea*, *Rhizopus nigricans*, *Pestalozzia hartigii*, and *Stysanus stemonites*, is given, while those on the kernels comprised species of *Penicillium* and *Mucor* as well as *B. cinerea*, and *R. nigricans*.

Black stem rust quarantine. Quarantine No. 38. Revision of Quarantine and issuance of regulations.—*U.S. Dept. of Agric. Plant Quarantine and Control Admin. Leaflet*, 4 pp., 1931.

This revision of Quarantine No. 38, effective from 1st August, 1931, places under quarantine every State of the Continental United States with respect to the inter-State shipment of species of *Berberis* or *Mahonia* in order to prevent the further dissemination of black stem rust (*Puccinia graminis*). No plants of these species shall be moved from any of the quarantined States into any of the protected States, namely, Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming, nor from one of the said protected States into any other protected State.

The Fruit Tree Pests (Wisbech District) Order of 1931.—2 pp., 1931.

This Order, effective as from 6th July, 1931, provides for the treatment in the Wisbech district of Cambridgeshire of fruit trees invaded by canker [*Nectria galligena*], brown rots [*Sclerotinia cinerea* and *S. fructigena*], or apple and pear scab [*Venturia inaequalis* and *V. pirina*] on the same lines as those indicated in the Fruit Tree Pests (West Norfolk) Order of 1930 [*R.A.M.*, x, p. 560].

The Panama Disease of Bananas Amendment Order, 1931. Under Section 3 of the Protection from Disease (Plants) Law 1925, Law 10 of 1925.—*Dept. of Sci. and Agric. Jamaica*, 2 pp., 1931.

The chief modifications in the Panama Disease of Bananas Amendment Order, 1931 (published in the Jamaica Gazette, 4th June, 1931), are the oil treatment [*R.A.M.*, x, p. 533] described in Section 3 (1) B, and Section 9 enabling a reduced treatment to be prescribed [cf. also ibid., vi, p. 128; vii, p. 492; x, p. 43].

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Lohwag (H.). **Zur Rinnigkeit der Buchenstämme.** [On the 'furrowing' of Beech trunks.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 8, pp. 371–385, 5 figs., 1931.

A full account is given of the phenomenon described as 'furrowing' of beech trees observed by the writer in the neighbourhood of Vienna. As a result of infection by *Fomes fomentarius* [*R.A.M.*, x, p. 350], longitudinal grooves develop in the heartwood, along which decay proceeds rapidly. When the groove, together with the mycelium, reaches the cambium, the latter is killed and its activity ceases; in the adjacent regions, however, cambial activity is increased, so that the grooves are mostly lined by healing overgrowth. The manifestation is attributed to the absence in the sap- and heartwood of a current of water, a condition favouring luxuriant mycelial growth.

Tubeuf [C. v.]. **Ist Pinus peuce gegen den Blasenrostpilz immun oder für ihn nur wenig disponiert?** [Is *Pinus peuce* immune from the blister rust fungus or only slightly susceptible to it?]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xli, 8, pp. 369–370, 1931.

Pinus peuce, formerly believed to be immune from attack by white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, ix, p. 691], has now been shown by observations in Upper Bavaria to be slightly susceptible, though very much less so than *P. strobus* and *P. monticola*.

Sreenivasaya (M.) & Rangaswami (S.). **Contributions to the study of spike-disease of Sandal (Santalum album, Linn.)**—*Journ. Indian Inst. Sci.*, xiv a, 5, pp. 59–65, 1931.

An ecological survey of some typical sandal (*Santalum album*) areas in Mysore, Coorg, and Madras was undertaken to determine the extent to which various hosts of this parasitic tree affect, especially its resistance or susceptibility to spike disease [*R.A.M.*, x, p. 697].

The results of the survey [which are tabulated and discussed] reveal some striking and suggestive differences between healthy and diseased areas. The latter are characterized by a complete absence or reduced incidence of certain species of plants, e.g., *Bar-*

leria buxifolia, Breynia rhamnoides, and *Pittosporum floribundum*, while conversely, the preponderance of certain species, such as *Atylosia albicans* and *Dodonea viscosa,* in healthy areas lends significant support to the theory that resistance to spike in sandal is governed by particular types of host. The high percentage of coppiced and dead stumps of host plants found in diseased areas confirms laboratory observations that infected sandal succumbs to spike more rapidly in the absence of a host. A marked connexion was further traced between the presence of spike and the preponderance or almost exclusive occurrence in association with the sandal of *Acacia pennata, A. sundra, Atalantia monophylla, Clausena wildenowii, Lantana camara* (4,747 plants in spiked compared with 284 in healthy areas), *Limonia acidissima, Phyllanthus polyphyllus, Pterolobium indicum, Strobilanthes kunthianus,* and *Triumfetta rhomboidea.*

Agricultural operations have been found to be constantly associated with the primary site of the first attack of spike, the felling of the host plants apparently rendering sandal susceptible to infection. The origin of the infective principal, however, still remains obscure.

BROWN (A. B.). **Observations on leaf fall in the Douglas Fir when infected with Rhabdocline pseudotsugae Sydow.**—*Ann. of Appl. Biol.*, xvii, 4, pp. 745–754, 1 pl., 1930.

After a brief account of the needle cast disease of Douglas firs (*Pseudotsuga glauca* and *P. douglasii* var. *caesia*) [*P. taxifolia*] caused by *Rhabdocline pseudotsugae*, which is stated to be based on the investigations of M. Wilson and Miss Wilson [*R.A.M.*, v, p. 637], the writer gives full details of his anatomical study of the abscission mechanism in this tree.

It was found that the abscission layers and associated tissues are laid down very early in the normal development of the leaf. In nature the leaves do not fall in strict progression in respect of age, indicating that defoliation is not due to the completion of an abscission mechanism from the histological standpoint. This is confirmed by the fact that, in the diseased tree, the infected leaves fall at an age of just over one year, with no abnormality of the abscission layers. The complete defoliation of infected leaves is evidently due to the abscission mechanism becoming effective under certain physiological conditions, foremost among which appears to be the marked decrease in the water content of the foliage caused by the fungus.

LIESE (J.). **'Zum Kiefernsterben in Nordwestdeutschland.'** [On the dying-off of Pines in north-west Germany.]—*Forstarch., 1931,* 17, pp. 333–334, 1931.

Dying-off of pines in north-west Germany has recently been attributed by M. Trènel of Berlin to a species of *Oedocephalum* characterized by simple conidiophores with capitate apices from which conidia radiate on all sides. A similar formation, however, is typical of the imperfect stage of *Polyporus* [*Fomes*] *annosus* (*Heterobasidium*), to which the writer is inclined to ascribe the pine disease [*R.A.M.*, v, p. 714; vii, p. 552; x, p. 699].

Vanine (S. I.). Домовые грибы, их биология, диагностика, и меры борьбы. [House fungi, their taxonomy, diagnosis, and control.]—112 pp., 45 figs., Гос. тип. изд. „Ленинградская Правда" [State Publishing Offices 'Leningradskaya Pravda'], Leningrad, 1931.

This little monograph gives a summary of the information contained up to date in the Russian and foreign literature dealing with wood-destroying fungi in dwellings, with more particular reference to those that are known to occur in Russia. Brief descriptions are given of 44 species, which are divided into four groups: Polyporaceae, Thelephoraceae, Agaricaceae, and Hydnaceae. Considerable space is devoted to the biology of the fungi, and to the methods for their identification both macroscopically and in pure culture, the characteristics of the various organisms being shown in three separate keys. Control measures are also dealt with at length. Most of the figures illustrating this book are original.

Vanine (S. I.). Меры борьбы с домовыми грибами. [Measures for the control of house fungi.]—*Plant Protection*, Leningrad, viii, 1, pp. 25–34, 1931.

In this paper the author gives some practical recommendations for the prevention of the infection of constructional timber with wood-rotting fungi, among which *Merulius lacrymans*, *Poria vaporaria*, and *Coniophora cerebella* are stated to be the most common and most dangerous in dwellings in Russia, and goes on to describe the measures for their control and elimination from infected buildings. A special section deals with the preparation and application of the more usual timber preservatives and fungicides, e.g., sodium fluoride, mercuric chloride, carbolineum, formaldehyde, sulphur dioxide, and the like.

Willrich (O.). **Ein Beitrag zur Bekämpfung von Holzschädlingen.** [A contribution to the control of timber pests.]—*Der Bautenschutz*, ii, 8, pp. 89–92, 1931.

Recently the Danish Technological Institute has devised a new method for the treatment by hot air of timber in buildings attacked by *Merulius lacrymans*, which may be carried out with the 'Deuba' apparatus (Deutsche Bauten-Trocknungs-Gesellschaft, Hanover). These machines, which heat the atmosphere to 250° C., consume about 1 cwt. mine coke and 4 to 5 kilowatts of electric current per hour. *M. lacrymans* cannot withstand a temperature above 40° [*R.A.M.*, x, p. 572], so that this method is very effective in its control.

Rabanus (A.). **Die toximetrische Prüfung von Holzkonservierungsmitteln.** [The toximetric testing of wood preservatives.]—*Angew. Bot.*, xiii, 4, pp. 352–371, 4 figs., 8 graphs, 1931.

A full account is given of the writer's laboratory experiments on the action of various timber preservatives (copper sulphate, zinc chloride, corrosive sublimate, sodium fluoride, sodium bichromate, and arsenic acid) on a number of wood-destroying fungi,

including *Fomes annosus*, *Merulius domesticus* [*M. lacrymans*], *Coniophora cerebella*, *Polystictus versicolor*, *Polyporus schweinitzii*, *P. vaporarius* [*Poria vaporaria*], *Lenzites abietina*, *L. sepiaria*, *L. trabea*, *Schizophyllum* [*commune*], *Stereum purpureum*, *Trametes pini*, and *Lentinus lepideus* [*R.A.M.*, x, p. 572].

It was evident from these tests that the action of a preservative on a fungus in the wood itself cannot be deduced from the reaction to the fungicide of the same organism on malt extract agar. It was further ascertained that the fungi under investigation vary widely in their reaction to the different preparations used, *C. cerebella*, for instance, being extremely sensitive to arsenic acid and very resistant to copper sulphate, while *Schizophyllum commune* is highly sensitive to both. It is not sufficient, moreover, to determine the inhibition limits of only one fungus by the wood block method and of the rest on agar, calculating the wood block values for the latter on the basis of the relation between agar and wood block values for the one organism tested by both methods, since there is no common factor to reduce all to the same level.

It has often been found in practice that the inhibition values obtained by the agar method are too favourable to the preservative, and that only those derived from the wood block method afford any clue to the action of the fungicide under natural conditions. On the other hand, practical experience has shown that the unfavourable results frequently given by the wood block method may not do justice to the fungicidal properties of certain substances, e.g., dinitrophenol. Further studies are in progress to elucidate these differences.

MÖRSDORF. **Schutz des Bauholzes gegen Fäulnis.** [Protection of structural timber against decay.]—*Der Bautenschutz*, ii, 3, pp. 29–34, 6 figs., 1931.

Directions are given in popular terms for the impregnation of structural timber in Germany against the wood-destroying fungi *Merulius lacrymans* and *Polyporus vaporarius* [*Poria vaporaria*], the biology of which is briefly described. For external application fluralsil (Brander Farbwerke Brand-Erbisdorf, Saxony) is stated to have proved very effective, applied first at a strength of 20 per cent., then, after drying, at 50 per cent., and finally undiluted. Rooms that have been invaded by the above-mentioned organisms should be treated with hot Avenarius carbolineum (1 kg. per 4 to 6 sq. m.) which penetrates deeply into the wood and kills the fungi without injuring the timber. Antinonnin (2 to 3 per cent.), supplied by the I. G. Farbenindustrie [*R.A.M.*, viii, p. 3], is an entirely odourless and very effective preparation which does not stain the wood. Mikrosol (Rosenzweig u. Baumann, Cassel) [ibid., iii, p. 492; iv, p. 250], a brown, water-soluble preparation almost devoid of odour, has also given excellent results.

WOLMAN [E. H.] & PFLUG. **Über Holzkonservierung mit wasserlöslichen Salzen.** [On timber preservation with water-soluble salts.]—*Zeitschr. für Angew. Chemie*, xliv, 34, pp. 696–698, 1931.

After a brief discussion of Curtin's zinc meta-arsenite process

of timber preservation [*R.A.M.*, ix, p. 80], the writers give an account of their tests with *Coniophora cerebella* and *Polyporus vaporarius* [*Poria vaporaria*] on pine sapwood blocks treated with 1 or 2 per cent. thanalith U, a proprietary compound containing dinitrophenol, fluoride, arsenic, and chrome salts, by the Berlin conference methods [ibid., x, p. 357]. The loss from leaching out in wood treated with the 2 per cent. solution was estimated at 36 per cent., but it is possible to reduce this loss to 20 per cent. for purposes in which resistance to lixiviation is of primary importance, e.g., under-water structures. The toxic minimum of the 1 per cent. solution for *C. cerebella* was 0·30 to 0·36 kg. per cu. m. of sapwood, compared with 0·22 to 0·29 kg. per cu. m. for *P. vaporaria*. Solutions of thanalith U ranging from 1 to 6 per cent. did not corrode Siemens-Martin ingot-iron either at room temperature or at 80° C., and their use is further stated to present no technical difficulty.

[An English version of this paper is published in *Chem. Age*, xxv, 635, p. 189, 1931.]

Moll (F.). **Holzschutz im Bauwesen.** [Timber protection in building.]—*Der Bautenschutz*, ii, 6, pp. 65–68, 1931.

Popular notes are given on the two main classes of timber preservatives in common use against fungous and insect pests in Germany, viz., coal-tar and its derivatives and metallic salts, of which corrosive sublimate, zinc chloride, and sodium fluoride are the most effective [*R.A.M.*, x, p. 572]. Of recent years an energetic campaign has been launched in favour of the dinitrophenol-containing Wolman salts (triolith, thanalith, &c.) [see preceding abstract], but these are not equal, in the writer's opinion, to the older-established methods.

Linford (M. B.). **Transpirational history as key to the nature of wilting in the Fusarium wilt of Peas.**—*Phytopath.*, xxi, 8, pp. 791–796, 2 graphs, 1931.

A uniformly susceptible pure line of the Alcross pea variety was grown in unsterilized, uninoculated soil and also in sterilized soil inoculated a year previously with a pure culture of *Fusarium orthoceras* var. *pisi*, both soils containing 60 per cent. of the water-holding capacity, retained by sealing with wax. The average total area of the uninoculated plants after 12 days was 96·4 sq. cm., and that of the diseased plants, all of which showed symptoms of wilt by the ninth day, 75·4 sq. cm. A study of the daily transpirational ratios of individual plants indicated that most of them underwent a rapid loss of water during wilting, and that reduced availability of water is not the primary factor, and possibly not a very important one, in the final wilting characterizing the severe early development of the disease. More significant is some fundamental alteration in the protoplasts of the leaf cells, probably their actual death, which involves the loss of their normal capacity for water retention with consequent loss of turgor and wilting of the leaves.

LINFORD (M. B.). **Studies of pathogenesis and resistance in Pea wilt caused by Fusarium orthoceras var. pisi.**—*Phytopath.*, xxi, 8, pp. 797–826, 8 figs., 1 graph, 1931.

The results of experiments carried out at Madison, Wisconsin, showed that the pea wilt fungus (*Fusarium orthoceras* var. *pisi*) [see preceding abstract] can infect the plant and produce the disease without the aid of other micro-organisms or of mechanical injury. The symptoms are readily developed by peas grown in cotton-plugged culture tubes of sterilized soil or of an agar substratum, inoculated with a pure culture of the pathogen. Wounding the root system was found slightly to delay the appearance of symptoms in plants of a susceptible variety (Badger) and did not impair the resistance of Horal.

In the typical development of pea wilt under conditions favourable for the disease, very distinctive changes precede wilting in the affected plants. These include pronounced dwarfing, increased rigidity of the entire shoot, hypertrophy of the lower stem internodes, and rolling of leaf laminae. Before wilting begins, diseased pea stems lose water more slowly on exposure to drying and have a higher content of dry matter with a proportionately increased ash content, a heightened osmotic value of the cell sap, and an augmented capacity for regeneration.

Filtrates from cultures of the wilt fungus on Richards's solution produce a type of rapid necrosis in cut pea stems which appears comparable to the sudden wilting of young plants in the early stages of the disease. Experiments with ten strains and varieties of peas failed to reveal any correspondence between resistance or susceptibility to the toxic culture filtrates and the same characters in relation to *Fusarium* wilt.

Water shortage directly or indirectly induced by the fungus may sometimes be a factor in the wilting of large plants, but probably not in the early collapse of young seedlings. Pathogenesis must be mainly attributed to the action of toxic substances resulting from the presence of the fungus within the host.

LINFORD (M. B.). **Wound inoculation in relation to resistance in the Fusarium wilt of Peas.**—*Phytopath.*, xxi, 8, pp. 827–833, 2 figs., 1931.

The symptoms manifested by pea plants inoculated in the above-ground parts with *Fusarium orthoceras* var. *pisi* [see preceding abstracts] differed somewhat from those typical of the wilt disease caused by this fungus. A few days after inoculation the growth of the terminal bud was retarded, the stems and petioles became swollen and rigid, and the leaflets and stipules rolled backwards or became distorted, thick, firm, and abnormally dark green, followed by the collapse of the stipules, leaflets, petioles, and stem tips. Some of the plants made partial recovery, resuming apical growth with the production of approximately normal leaves.

Even in the most severely damaged plants infection remained localized within the vascular bundles first penetrated by the fungus, the vertical extent of the invasion apparently being limited by the occlusion of vessels with brown, granular or gum-

like wound reaction products. In no case was the fungus observed to traverse more than two internodes from the point of inoculation. The local development of the fungus stimulated the surrounding parenchymatous cells to the formation of a cambium-like layer and a sheath of new tissue several cells in thickness encircling the xylem portion of the bundle. This occurred both in the central cylinder and around infected stipule traces in the cortex.

This limited extent of the infection makes it evident that the wilting and ultimate collapse of the affected organs result from the distribution of toxic products of the fungus throughout the plant. No marked differences in reaction to stem inoculations were observed in resistant as compared with susceptible pea varieties, indicating that varietal resistance is located in the root system.

ABRAMOFF (I. N.). Грибные болезни Соевых бобов на Дальнем Востоке. [Fungal diseases of Soy-beans in the Far East.]—pp. 3–84, 41 figs., in Болезни и вредители Соевых бобов на Дальнем Востоке. [Diseases and pests of Soy-beans in the Far East.]—Pamphlet issued by *Дальстазра* [*Far-Eastern Plant Prot. Stat.*], Vladivostock, 120 pp., 55 figs., 1931.

In this paper the author gives an account of the following fungal diseases of the soy-bean which were recorded in the Russian Far East during a preliminary phytopathological investigation in 1928 and 1929. Downy mildew (*Peronospora manshurica*) [*R.A.M.*, x, p. 638] may either produce localized infection, in which case the damage is insignificant, or systemic, causing a noticeable stunting of all the aerial organs of the host with a consequent considerable reduction in yield; although the disease is widespread throughout the country, the second form only appears in some localities, chiefly on the so-called Gundzhuli variety (*Glycine hispida* var. *albo-flavida* f. *latericia* Tupik.). Observations on varietal reaction indicated that the greatest susceptibility is exhibited by the varieties with yellow or green beans, while those with black and brown beans were practically immune under the same conditions.

White stem rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*] inflicts considerable losses in some districts, especially where there is much sunflower cultivation. All varieties are apparently equally susceptible to this fungus, one of the chief measures for the control of which, in addition to the usual sanitary precautions in the field, is the avoidance of sowing soy-beans in rotation with the highly susceptible sunflower.

Leaf spot caused by *Cercospora daizu* [the spelling *diazu* as used by some authors is not that given in Miura's original diagnosis: cf. ibid., vii, p. 760; ix, p. 289] was also observed. The fungus showed a wider range of measurements of the conidia than those given in the original diagnosis, namely 22 to 86 by 5 to 9 μ instead of 39 to 70 by 5 to 6 μ, but this may have been due to the greater number of spores measured, the average length (52·2 μ) being very close to that indicated by Miura (54·5 μ). This species appears to be closely related to *C. cruenta* [ibid., ix, p. 187], from which it differs only in having shorter and thicker spores produced

on only one side of the leaf. The spots caused by the fungus were occasionally found to bear perithecia of *Mycosphaerella phaseolicola* (Desm.) Sacc., which may be its perithecial stage.

Soy-bean seedlings are frequently killed by a serious blight caused by a strain of *Fusarium* with falcate, hyaline (pinkish in the mass), four- to five-septate conidia, 25 to 42 (majority 35 to 37) by 2 to 3 μ. In wet weather the lesions on the hypocotyl, cotyledons, and collar of the seedlings develop a downy, white aerial mycelium which later forms bright pink or orange crusts. Diseased seedlings may occasionally recover, but the resulting plants always remain stunted, and not infrequently from 30 to 60 per cent. of the stand is killed. The chief source of infection seems to be the seed, and it is recommended not to use seed from crops infected with this blight. Tracheomycosis or wilt caused by *F. tracheiphilum* [ibid., ix, p. 360] is chiefly prevalent in the Littoral province. In late summer soy-bean leaves frequently show a severe spotting, with subsequent dropping-out of the diseased tissues, which is caused by a strain of *Fusarium* closely resembling *F. tracheiphilum*. In the district of Vladivostock a serious stem break of young plants, which killed from 9 to 42 per cent. of the crop, was observed in 1929. It was caused by an unidentified fungus believed to be a *Fusarium*, with hyaline, frequently septate hyphae, 5 to 8 μ in diameter, which, when the diseased plants were placed in a moist chamber, in two days formed an abundant downy, white efflorescence, but produced no spores. When approaching maturity the soy-beans still in the pods (chiefly those attacked by the larvae of a species of *Eucosma*) are frequently covered with a pink efflorescence, consisting of conidia of a *Fusarium* differing from those mentioned above; the spores are hyaline, slightly bent (more so at the distal end), usually one-, but occasionally two- or three-septate, and measure 38 to 45 by 3 to 4·5 μ. The cotyledons of the diseased beans also bear numerous perithecia of a species of *Gibberella* which may be the ascigerous stage of this *Fusarium*.

A very widespread disease, particularly on the Amur and in the Littoral province, is caused by a species of *Ascochyta* which differs from *A. phaseolorum* and *A. pisi* in its morphological characters and symptoms [the differences being shown in a comparative table]; it is considered to be new to science and is named *A. sojaecola*, a Latin diagnosis being appended. The fungus attacks the leaves, stems, and pods [the symptoms on which are fully described], on which it forms numerous slightly sunken, spheroidal, dark pycnidia, 30 to 220 μ in diameter, containing hyaline, cylindrical or slightly ellipsoidal, two-celled spores, slightly constricted in the middle, and 8 to 11 by 3 to 5 μ. The disease is most severe in dense stands sown for fodder, and on varieties with black or brown beans, while those with green beans are apparently immune. Among the varieties with yellow beans, those with purple flowers were rather severely attacked, and those with white flowers were comparatively resistant.

The other diseases recorded include a leaf spot caused by *Septoria glycines* [ibid., ix, p. 228]; an olive-coloured leaf spot due to *Phyllosticta sojaecola* in association with its ascigerous stage

Pleosphaerulina sojaecola [ibid., vi, p. 74; ix, p. 227]; angular, brown spots caused by *Isariopsis griseola* [ibid., ix, p. 626]; and a grey mouldiness of the leaves due to *Hypochnus centrifugus* [*Corticium centrifugum*: ibid., vi, p. 74]. Brief descriptions are also given of a number of saprophytic fungi found on the soy-bean plants (among which *Alternaria tenuis* [ibid., xi, p. 77] is stated occasionally to attack leaves weakened by other causes, and thus to hasten their destruction), as well as of fungal diseases which are known to affect this host elsewhere but have not yet been recorded in the areas investigated.

Мозаичные болезни Сахарной Свеклы. [Mosaic diseases of the Sugar beet.]—286 pp., 22 pl., 12 figs., 17 graphs, Plant Breeding Dept. of Union Sugar Industry, Kieff, 1930. [English summary. Received July, 1931.]

This book consists of a collection of articles [with English summaries] on the results obtained in the study of the virus diseases of the sugar beet in the Ukraine. Two of these (by P. A. Proyda and I. S. Shevtchenko, respectively) give detailed accounts of the work done from 1925 to 1927 and in 1928–1929 at the Kharkoff District Agricultural Experiment Station; one (by A. I. Novinenko) deals with the insect vectors of the diseases; and two (by V. I. Shevtchenko and L. M. Shevtchenko, respectively) give data on the economic importance of sugar beet mosaic, and the influence exerted on its development by different dates of sowing. In a brief paper A. M. Levshin claims to have confirmed the presence in mosaic tissue of the sugar beet of the intracellular bodies ('elytrosoma') described by Schaffnit and Weber [*R.A.M.*, vii, p. 108]. V. P. Mouravieff [under whose general direction the whole investigation was conducted] contributes three papers, one of which is a review of the relevant Russian and foreign literature up to date, the second gives a very full description of the various forms of mosaic patterns observed on the foliage of the sugar beet, and the third is a detailed summary [with an English version extending to some 40 pages] of all the results obtained in the work, a brief outline of which is also given in a concise statement by T. D. Strakhoff at the beginning of the volume [the only paper without an English summary].

As taken from these two summaries, the investigation indicated that although the virus diseases of the sugar beet were first officially recorded in the Ukraine in 1925, they are probably of much longer standing; at the present time their presence has been definitely established over practically all the beet-growing areas of the Ukraine, the central Russian black soil belt, the north Caucasus, and in several other localities. In dealing with the different forms of the diseases encountered, it is stated that curly top has not yet been found, and that although the considerable variations in the mosaic patterns seen on the foliage would indicate that there is more than one type of mosaic, the results so far have failed to give conclusive evidence as to whether each is due to a single entity or to the combination of two or more viruses. In the neighbourhood of Vinnitza (Podolia) a form was observed on sugar beets growing at a distance of half a kilometre from

tobacco plants affected with ring spot, which was very reminiscent of this disease, and which is believed to have been transferred from the tobacco to the beet; besides the characteristic pattern of the spots, the disease on the latter host is distinguished from the usual mosaic by the ease with which it is transmitted by the juice from diseased plants. The economic importance of this disease of the sugar beet has not yet been established.

Confirmation was obtained that sugar beet mosaic is not transmitted by the seed or through the soil [cf. ibid., x, p. 574]. The chief source of primary infection of beet seedlings in the spring is the second year seed plants, a high percentage (ranging from 15 to 100) of which are usually infected. It was shown that the incidence of infection among the seedlings rapidly decreased as their distance from the mother beets increased, the lowest safe limit being 770 m. Another important source of infection is believed to be weeds, numerous species of which are known to harbour virus diseases; among these *Chenopodium album*, *Amaranthus retroflexus*, and *Sonchus arvensis* were experimentally infected by *Aphis fabae* [*A. rumicis*] with the beet mosaic, the disease having been also successfully transmitted from the two last-named species to beet. There was some evidence that infection may also be carried by cultural implements, e.g., knives used for topping indiscriminately diseased and healthy plants, but this needs further confirmation. In storage, infection was shown to occur through direct contact between mosaic and healthy roots. The fact that infection of the seedlings in the spring usually occurs before the appearance in the fields of the aphid vector is considered to indicate that other insects are implicated in the dissemination of the disease, the most active of these carriers probably being *Lygus pratensis*, *Poeciloscytus cognatus*, and *Chlorita flavescens*.

No differences were observed in the relative resistance to mosaic of the very numerous strains of sugar beet which were tested, but some strains appeared to be more tolerant of the disease than others, as shown by the weight and sugar content of the roots, while in a few strains the disease even appeared to increase the weight of the roots and their sugar content. Mouravieff suggests an explanation of this apparent paradox by the hypothesis that in the field it is usually the more vigorous plants with luxuriant foliage that attract most of the insect vectors; such plants, although infected at an earlier date and presumably carrying more virus than weaker ones, very likely preserve their greater vigour up to the end of the vegetation, and finally show much less effect of the disease than the weaker ones, even though the latter are less severely infected. This hypothesis finds support, in his view, in the general experience that crops raised from ordinary commercial (sugar-factory-produced) seed, which consist of a very mixed population, usually show much less decrease in root weight and sugar content than crops raised from pure lines of seed produced by the plant breeding stations, the population of which is much more uniform. The actual effect of mosaic on yield both in root weight and sugar has not yet been finally established, and needs further investigation in view of the contradictory results so

far obtained. The yield in seed is, however, definitely adversely affected by the disease.

Owing to its endemic and widespread character the disease is very difficult to bring under control, but much might be done by a careful selection of undoubtedly healthy plants for seed production, the removal of seed-plant plots as far as feasible from the sugar beet fields [ibid., x, p. 575], and measures directed towards the suppression of weeds and insect carriers.

SOLUNSKAYA (Mme N.). Урединоз Сахарной Свеклы. [Sugar Beet rust.]—*Наукові Записки з Цукрової Промисловости.* [*Sugar Industry Scient. Notes*], Kieff, xiii, 2, pp. 609–611, 4 figs., 1931.

In this brief note the author states that sugar beet rust (*Uromyces betae*), which hitherto was of little consequence in the Ukraine, is now steadily gaining ground, new foci being discovered almost every year. This raises the question of the possibility that infection is introduced into new areas by the seed, some samples of which, especially of German origin, have been proved to carry the spores. In one locality the uredosori of the rust were found to be heavily parasitized by *Darluca filum* [*R.A.M.*, v, p. 314], but the control of the rust by means of this fungus is not thought to be appreciable since it usually appears towards the end of the development of the disease.

STIRRUP (H. H.) & EWAN (J. W.). **Investigations on Celery diseases and their control.**—*Min. of Agric. & Fish. Bull.* 25, 34 pp., 5 pl., 3 figs., 1931.

The chief seedling disease of celery in the Isle of Axholme, north Lincolnshire, is a root rot, probably due to *Pythium artotrogus* [*R.A.M.*, vi, p. 360], which starts at the root tips and works backwards. In mild attacks the patches of seedlings present a slightly withered appearance, with drooping cotyledons, and are readily pulled out, the root tips and sometimes the whole of the secondary rootlets being shrivelled, rotting, and reddish-brown. In severe cases many seedlings collapse and lie on the surface of the soil about the time when they are breaking into the first 'rough' leaf. Others remain erect but turn purplish-red, with drooping cotyledons. The roots of such plants and part of the hypocotyl are destroyed, leaving only shrivelled, reddish-brown remnants. The diseased roots were constantly found to contain smooth-walled oospores contained in bluntly spiny oogonia resembling those of *P. artotrogus.* The ordinary and resting sporangia of a Chytridiaceous fungus, probably an *Olpidium,* were also found in association with the *Pythium.* Good control of this disease may be obtained by soil disinfection with formalin at the rate of 2 to 4 pints per sq. ft.

Both seedlings and adult plants are attacked by *Phoma apiicola* [ibid., ix, p. 357], which infects the region just below the collar. This disease is to some extent seed-borne and partially controllable by seed treatment with formalin or mercuric chloride.

The two distinct types of leaf spot (*Septoria apii*) symptoms are described [ibid., x, p. 430]. The standard seed treatments for the control of this disease are only partially successful, viable

pycnospores being obtainable from the pycnidia of the fungus on infected seed after immersion in dilute formalin. The best results have been given by soaking the seed for periods up to 24 hours in 40 per cent. formaldehyde at a dilution of 1 in 400. The results of five years' spraying and dusting experiments [which are described in detail] showed that home-made Bordeaux mixture gave the best control of leaf spot, the net increase due to spraying in 1926 being estimated at £45 8*s*. 9*d*. per 1,500 bundles (one acre). In 1927 sprayed celery (100 bundles) realized 30 shillings in the market compared with 10 for unsprayed. Commercial quantities of celery seed free from infection by *S. apii* have been obtained by the use of carefully selected seed and regular spraying of the plants during their two years' growth.

Bremer (H.). **Der Spargelrost.** [Asparagus rust.]—*Obst- und Gemüsebau*, lxxvii, 8, pp. 132–134, 3 figs., 1931.

A popular account is given of asparagus rust [*Puccinia asparagi*], which occurred in epidemic form in Germany during the summer and autumn of 1930 [*R.A.M.*, x, p. 816]. The full extent of the losses from this disease cannot be gauged until the following season; in the present case they are estimated at about M.10,000,000. Some suggestions for the prevention of the disease are made.

Kordes (H.). **Eine durch Bakterien hervorgerufene Blattflecken-krankheit der Gurken. Vorläufige Mitteilung.** [A leaf spot disease of Cucumbers caused by bacteria. Preliminary note.] —*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 8, pp. 63–64, 3 figs., 1931.

For some years cucumbers in the Frankenthal district of the Palatinate have been affected by a bacterial disease in which the older leaves are covered with sharply delimited, brown (occasionally greyish-white or yellowish) spots. The causal organism is believed to be *Pseudomonas* [*Bacterium*] *lacrymans* [*R.A.M.*, ix, p. 10]. In most seasons the disease only appears towards the middle or end of August, when the cucumber harvest is nearly over, but in 1931 infection was observed at the end of June and spread was extensive.

Trochain (J.). **La 'lèpre' de l'Arachide au Sénégal.** ['Leprosy' of Groundnut in Senegal.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xi, 117, pp. 330–334, 1931.

The author states that the disease of groundnuts known in the vicinity of Baol and Cayor, Senegal, as 'leprosy' ('gana') is in reality rosette. The affected plants have a tufted, witches' broom-like appearance, with variegated, crinkled, shrivelled leaves, and a generally yellowish appearance. The term 'leprosy' is used as denoting the symptoms on the branch tips, where the terminal leaves show patches of chlorosis and break away from the rachids.

Other plants growing near by showed almost complete sterility; they were much smaller than normal, e.g., 20 cm. instead of 50 to 60 cm. in diameter, and had vertical shoots with dwarfed, crinkled, excessively dark green or yellow leaves. The internodes were shortened, giving the plants a bunchy, lettuce-like appearance.

In the author's opinion, this condition corresponds to that known as 'clump' in India [*R.A.M.*, viii, p. 696] and is of physiological origin, resulting from mechanical injury, insect attack, or some unfavourable condition of growth. Either condition may become superimposed on the other, resulting in a lettuce-like plant with mosaic leaves.

In some experimental fields near Thiès all the plants were affected by rosette; in Bayol and Cayor the average amount of the disease was 10 to 15 per cent.

Under the conditions prevailing locally, control methods should consist in roguing, using only clean seed, prohibiting the import into unaffected areas of seed from areas where the disease is present, early sowing (rosette is commonest on varieties sown after the first rains), and the use of resistant varieties such as Basse, Philippine Pink, and Philippine White [cf. ibid., xi, p. 27].

OLTARJEVSKI (N. P.). Ориентировочная кривая мильдью Винограда (**Plasmopara viticola**) в районе Дербента по данным одного вегетационного периода **1929** года. [The provisional curve of Vine mildew (*Plasmopara viticola*) in the region of Derbend, based on the data obtained in the single vegetative season of 1929.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 155–160, 3 graphs, 1931.

In this paper the author gives details of his meteorological observations in 1929 in Derbend (Daghestan) during the vegetative period of the vine, in connexion with the varying length of the incubation period of mildew (*Plasmopara viticola*). On the ground of the data obtained he constructed a preliminary 'incubation curve' of the disease for the Derbend region. In pointing out the deviations of this curve from that established by Müller [*R.A.M.*, x, p. 432], he states that similar observations during a number of consecutive years may tend to smoothe out the differences. In any case, the investigation demonstrated, in his view, the entire feasibility of working out such curves for the different vine-growing regions of the world, in order to predict the likely date of mildew outbreaks in any given year, and under any given set of climatic conditions.

SALMON (E. S.) & WARE (W. M.). **Report from the Mycological Department.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxviii, pp. 48–56, 1931.

This report contains the following items of phytopathological interest, apart from those already noticed from other sources. *Roesleria hypogaea* was found on rose roots [*R.A.M.*, vi, p. 33]; a *Pythium* caused a root rot of young tomatoes about to be moved into the greenhouse in the second week of February; a root rot of young cucumbers was also due to a *Pythium*; and two instances were noted of the physiological blackening, usually evident only after boiling, of potato tubers, associated with deficient potassium in the soil and rough handling [ibid., ix, p. 741]. Apricot branches bearing shield-shaped cankers were infected by *Monilia* [*Sclerotinia*] *laxa*, considered by Wormald to be a synonym of *M.* [*S.*] *cinerea* [ibid., vi, p. 619]. Quince leaves and blossom spurs

attacked by *S. cydoniae* were received from Hampshire and *S. mespili* was noted on a medlar tree at Wye, Kent. Potato blight (*Phytophthora infestans*) appeared in the last-named locality on 10th July, and, favoured by the wet summer, soon destroyed any haulm which had been left unsprayed or which had been sprayed too late; the Incomer variety was the most resistant, while President was also highly resistant, and Arran Chief somewhat so.

Plaster-mould disease (*M. fimicola*) of mushroom spawn [ibid., vii, p. 488] was reported from two localities.

During the wet summer of 1930, no spraying was carried out in the hop nursery at Wye, and downy mildew (*Pseudoperonospora humuli*) was allowed to develop unchecked. The new seedling varieties M 45 and L 21, both of which show commercial promise, completely resisted the disease, as did about 12 others, the cones remaining green while those of adjoining varieties turned brown.

Marchal (P.) & Foëx (E.). **Rapport phytopathologique pour l'année 1930.** [Phytopathological report for the year 1930.] —*Ann. des Épiphyties*, xvii, 1, pp. 1–112, 1931.

This report on the phytopathological situation in France in 1930, which is on the same lines as those for previous years [cf. *R.A.M.*, x, p. 10], contains very numerous items of interest, some of which have already been noted from other sources, and only a few of which can be referred to here.

Ring spot of tobacco [ibid., x, pp. 60, 132, 615] was observed in the vicinity of Erstein and Obernai (Bas-Rhin). *Ascochyta pisi* attacked 'Très hâtif d'Annonay' peas at Versailles in July, while in August it severely affected Caractacus and 'Téléphone' peas. All three varieties were killed off by September. Isolations from leaf and pod lesions gave *A. pisi* while those from the collar gave *Mycosphaerella pinodes* [ibid., x, pp. 284, 586].

The mildew of melons caused by *Erysiphe polygoni* [ibid., x, p. 289] is the most serious disease of this host in Provence, and in 1930 caused heavy losses in Vaucluse, where the growers attempt to control it by preventive treatment with sulphur and curative measures with potassium permanganate. The sulphur is frequently applied in the form of cupric sulphosteatite dust and while some varieties, such as Charentais and Montauban, tolerate sulphur, others, such as the cantaloupe melon, may sustain severe injury.

In a detailed note of the severe invasion of vine mildew (*Plasmopara viticola*) which occurred during the period under review [ibid., x, p. 579] it is stated that the Bordeaux station of agricultural information observed six main invasions [the dates of which are given] between 11th May and 18th July. The two infections which caused most damage to the leaves and fruit took place on 11th and 24th June.

Some of the soft-wooded varieties of poplar, notably that known as 'Vieux noir du pays' or 'Peuplier du pays', which appears to belong to the *Populus balsamifera* type, show moderate resistance to canker [attributed by Delacroix to *Micrococcus populi*: ibid., x, p. 567], which appears to extend from the Somme valley, in the vicinity of Amiens and Bray as far as the Aisne, near Soissons,

but is also present in the valleys of the rivers Ourcq, Petit Morin, and Grand Morin, while there are isolated foci of infection in Oise, Seine-Inférieure, Aube, Marne, and elsewhere. Dutch elm disease (*Graphium ulmi*) [cf. ibid., x, p. 277] continues to be prevalent throughout France. According to Guinier, *Ulmus montana* is more resistant than *U. campestris* [cf. ibid., x, p. 695], which is attacked when growing in forests even on the richest soil. Elms growing in parks and along roads and canals [loc. cit.] are still more liable to become infected; dry and impacted soils, for example, reduce the resistance of the trees, while wounds also diminish their vitality.

Ailanthus glandulosa trees in Paris are still suffering from the dying-off disease previously reported [ibid., ix, p. 753] as being caused by *Verticillium dahliae.*

Infections of a type of *Anemone coronaria* intermediate between the cultivated and wild forms with *Tuburcinia antipolitana* were obtained experimentally for the first time, the fungus effecting penetration only at germination; after a month to six weeks the pustules of *T. antipolitana* appeared on the swollen collar of the plant.

Further investigations into the relations between walnut root rot (*Armillaria mellea*) and limestone deficiency in the soil [ibid., vii, p. 686] confirm the observation that the richer the soil is in this element the less severe is the disease, which tends to disappear when the soil contains 20 per cent. of lime.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1930.** [Report on the activities of the Phytopathological Service in the year 1930.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 64, 189 pp., 8 pl., 1 fig., 2 diags., 1 graph, 1931.

This report, prepared on the usual lines [*R.A.M.*, x, p. 293], contains a number of interesting items, of which the following may be mentioned. Rape [*Brassica napus*] stems and roots submitted for examination were found to be heavily infected by *Rhizoctonia*, while *Phoma* pycnidia were also present. The latter are believed to be those of *P. brassicae* or *P. oleracea* [*P. lingam*: ibid., vii, p. 71; x, p. 327], which is transmissible by the seed and may be controlled by 30 minutes' immersion in 0·125 per cent. germisan. Only in a few cases was the pathogen detected on the cotyledons, but within 14 days of germination small brown stripes appeared on the stems, and pycnidia rapidly developed under humid conditions. Up to 50 or 60 per cent. infection was found in some lots of seed.

Pear branches were attacked by *Phomopsis* (*Diaporthe*) *ambigua*, which is stated to be of very rare occurrence in Holland [ibid., ii, p. 53].

Three-year-old mulberry trees were infected by a fungus apparently identical with *Gibberella moricola* (*Fusarium lateritium*), the cause of heavy damage to the same host in Italy [ibid., v, p. 15]. The diseased leaves are characterized by a blackening of the edges.

The Dutch iris variety, Jacob de Wit, was attacked at Leyden

by *Sclerotium delphinii* [ibid., ix, p. 529]. *Gloeosporium allescheri* caused exceptionally severe injury to a number of *Kentia* palms at a large commercial nursery in Amsterdam.

Juniperus and *Biota* [*Thuja*] seedlings at Doorn suffered from an extensive die-back which is tentatively attributed to a strain of *Phomopsis juniperovora* [ibid., x, p. 569]. *T. gigantea* at Bussum showed infection by *Keithia* [*Didymascella*] *thujina* [ibid., ix, p. 145].

The section of the report dealing with investigational work contains notes, *inter alia*, on experiments in the control of various seed-borne diseases of cereals; flax, and beet [ibid., xi, p. 64], and of the 'grease spot disease' [*Bacterium medicaginis* var. *phaseolicola*: ibid., x, p. 423] of beans [*Phaseolus vulgaris*], and particulars of studies on potato virus diseases. Further details are given concerning the work of the 'cautionary service', acting in collaboration with the Royal Dutch Meteorological Institute, in the issue of warning notices advising growers of impending attacks of potato blight [*Phytophthora infestans*: ibid., ix, p. 16]. In North Holland the disease was unusually severe following critical days on 1st and 12th July, while a wide extension was also reported from the Scherpenisse district of Zealand after a critical day on 24th July. In South Holland heavy infection occurred after 24th and 25th July and 3rd and 5th August.

The symptoms of the yellowing disease of beets [ibid., x, pp. 293, 488] are stated to run a somewhat different course on clay and on sandy humus soils, reaching a climax on the former towards the close of the growing season, while on the latter they culminate at the end of July or beginning of August, so that by the autumn the plants have almost entirely recovered. Notes are given on two other types of beet leaf discoloration, one of which is believed to be merely a variant of the yellowing disease while the other, characterized by a pale green tinge and small, white, 'shot hole' spots, appears to be distinct.

At Hilversum *Ulmus plumosa* [var.] *fastigiata* has so far remained free from infection by *Graphium ulmi*. In Amsterdam *U. umbraculifera* and *U. rueppellii* have been found the most susceptible varieties; during the years 1927 to 1929, inclusive, 587 of the 30,000 elm trees in this city died.

Douglas firs [*Pseudotsuga taxifolia*] in various parts of the country have been found to be attacked by *Rhabdocline pseudotsugae*, but Schuphan's report of the occurrence of this fungus in nurseries at Boskoop [on *Abies* spp.] is again stated to be without foundation [ibid., x, p. 571].

McCurry (J. B.). **Report on the prevalence of plant diseases in the Dominion of Canada for the years 1927 and 1928.**—*Canada Dept. of Agric., Exper. Farms Branch*, 114 pp., [? 1931]. [Mimeographed.]

Notes are given on the occurrence of fungous, bacterial, and non-parasitic diseases on cereals, fodder crops, potatoes and other vegetables, fruit, forest and shade trees, tobacco, and ornamental plants in Canada during the years 1927 and 1928 [cf. *R.A.M.*, x, p. 360].

DEIGHTON (F. C.). **Mycological work.**—*Ann. Rept. Agric. Dept. Sierra Leone for the year 1930*, pp. 28–31, 1931.

Sphacelia disease, apparently identical with that recorded from the Gold Coast, was observed for the first time in Sierra Leone on bulrush millet [*Pennisetum typhoideum*] at Njala [*R.A.M.*, vii, p. 712].

Ear rot of maize, caused by *Diplodia* (?) *macrospora* [ibid., ix, p. 712], was prevalent at Njala at the end of 1929. The ears inside the husks were covered with a white, woolly mycelium, and pycnidia were formed on the husks and over the ears.

Both in 1929 and 1930 specimens of upland and swamp rice infected by a fungus probably identical with *Ustilaginoidea virens* [ibid., x, p. 684] were received from Njala and Shenge.

The *Marasmius* previously reported to be attacking the pseudostems of Guinea Negro and (to a lesser extent) of Canary bananas on low-lying, heavy soils in the Northern Province [ibid., ix, p. 19] has been identified as *M. stenophyllus* Mont. (*M. semiustus* Mass.) [ibid., xi, p. 25]. Plantains [*Musa paradisiaca*] planted near the diseased bananas were found two months later to be infected by the same fungus.

A species of *Gloeosporium* [? *G. manihotis*: cf. ibid., vii, p. 15] was apparently responsible for a die-back of cassava twigs.

Young grapefruit leaves and Genoa lemon fruits were attacked by scab [*Sporotrichum citri*: ibid., x, p. 81], which was also fairly common on the leaves and fruit of old rough lemon trees at Njala. Young lemons in the same place were severely attacked during the latter part of 1930 by *Gloeosporium*.

Fomes lamaoensis was found on dead kola [*Cola acuminata*] trees which were probably killed by the fungus, near Port Loka [cf. ibid., x, p. 80].

Bush greens (*Amaranthus*), carrots, and turnips were attacked by *Rhizoctonia* [*Corticium*] *solani*, which was also found causing the die-back of leaves and young stems of chilli [*Capsicum annuum*] and *Thevetia neriifolia*.

CUNNINGHAM (H. S.). **Report of the Plant Pathologist, 1930.**—*Rept. Dept. of Agric., Bermuda, for the year 1930*, pp. 33–39, 1931.

Notes are given on the incidence of insect pests and fungous diseases on cultivated plants in Bermuda during 1930, among which may be mentioned powdery mildew of beans [*Phaseolus vulgaris*] caused by *Erysiphe polygoni*, black rot of cabbage and other crucifers [*Pseudomonas campestris*], and *Phytophthora* rot, mosaic, and yellow flat of lilies [*R.A.M.*, vi, p. 716; x, p. 667].

BLAIN (W. L.). **A list of diseases of economic plants in Alabama.**—*Mycologia*, xxiii, 4, pp. 300–304, 1931.

This is a simple enumeration of all the economically important parasitic and non-parasitic diseases which are so far known to occur on 86 species of cultivated plants and trees in the State of Alabama, listed in the alphabetical order of the common names of their hosts.

JOHNSON (DELIA E.). **The antibiosis of certain bacteria to smuts and some other fungi.**—*Phytopath.*, xxi, 9, pp. 843–863, 6 figs., 1931.

A full account is given of the writer's investigations at St. Paul, Minnesota, on four types of bacteria which are antibiotic to certain smuts and other fungi [*R.A.M.*, ix, p. 373 and below, p. 103]. They consist of a Gram-negative, non-motile coccus isolated from oat smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) and maize smut (*U. zeae*) sori; a motile, non-spore-bearing, rod-like bacterium, also associated with the foregoing smuts; a motile, spore-bearing, rod-like bacterium found as a contamination in black chaff [*Bacterium translucens* var. *undulosum*] cultures; and a *Myxobacterium* also occurring in association with black chaff.

The presence of these organisms inhibited the full development of cultures of various fungi, in some of the smuts apparently because they produced enzymes capable of causing the dissolution of the sporidial cell walls. Additional factors are evidently involved in the antibiotic property, since certain other bacteria with the same type of enzymes failed to affect the sporidia of the identical smuts. The results of experimental work with cultures of all the above-mentioned organisms except the *Myxobacterium* indicate that the infection of maize by *U. zeae* may be inhibited to some extent by their use under proper conditions. The bacterium associated with *Bact. translucens* var. *undulosum* also prevented the development of *Pyronema* and other species of soil fungi.

GASSNER (G.) & HASSEBRAUK (K.). **Untersuchungen über die Beziehungen zwischen Mineralsalzernährung und Verhalten der Getreidepflanzen gegen Rost.** [Investigations on the relations between mineral salt nutrition and reaction of cereal plants to rust.]—*Phytopath. Zeitschr.*, iii, 6, pp. 535–617, 3 diags., 6 graphs, 1931.

A detailed account, accompanied by 27 tables, is given of the writers' experiments at the Brunswick Botanical Institute on the influence of mineral salts on the incidence of rust in cereals [cf. *R.A.M.*, ix, p. 442].

The most suitable material for these investigations was found to consist of seedlings of moderately resistant or moderately susceptible varieties, in which the rust symptoms were modified to a much greater extent by the different minerals than was the case with either the highly resistant or the very susceptible.

All the rusts used, viz., *P. triticina*, *P. glumarum* f. *tritici*, and *P. graminis* f. *tritici* on wheat, *P. coronifera* [*P. lolii*] on oats, *P. dispersa* [*P. secalina*] on rye, and *P. simplex* [*P. anomala*] on barley, responded in virtually the same manner to the action of mineral salts.

Generally speaking, heavy doses of nitrogen definitely prolonged the sporing period of the rusts, except in the case of *P. graminis* on the Hessian local variety of wheat. Increasing doses of potash resulted in an accession of resistance to rust when the other nutrient substances remained constant. A still more marked effect was observed when the dose of potash was increased while simultaneously the nitrogen and phosphoric acid applications were

reduced. Nitrogen always promoted the development of rust, but this action was most evident when the nitrogen was applied in excess of potash and phosphoric acid. In the neutral soil used for the tests the highest incidence of rust generally followed the application of ammonium salts, the effects of the nitrates of calcium, sodium, and potassium being less marked. In fact, the two last-named salts, applied in excess, may lead to an increase of resistance. The action of phosphoric acid is always dependent on the amounts of potash and nitrogen simultaneously available. Increased resistance occurs when phosphoric acid is present in excess over potash and nitrogen.

In judging the effect of the mineral salts on the reaction of cereals to the rust fungi, attention must be paid to the assimilatory activity of the leaves as a variable factor. Heavy rust infection is primarily dependent on liberal nitrogen applications and at the same time on adequate assimilatory activity. Since the albuminous nitrogen content of the leaves is particularly high under these conditions, there is a clear correlation between susceptibility to rust and the albumin content of the foliage. The rust-reducing action of heavy doses of potash also appears to be connected with the albumin supply of the foliage, since plants receiving an excess of potash show a decline of the albumin content.

A bibliography of 108 titles is appended.

PASINETTI (L.). **Le teleutospore di 'Puccinia graminis' e la loro refrattarietà all'azione dei raggi X.** [The teleutospores of *Puccinia graminis* and their insensibility to the action of X-rays.]—*Riv. Pat. Veg.*, xxi, 5–6, pp. 137–143, 1931.

One series each of dry and damp teleutospores of *Puccinia graminis* were exposed [by a method which is indicated] for periods of 10 to 30 minutes to X-rays, duplicate sets being exposed to ultra-violet rays of a wave length of 3,650 Angström obtained by Wood's filter, and remaining unexposed. A fortnight later the first two batches were submitted to a second exposure. After a further fortnight a few of the teleutospores exposed to the ultra-violet rays showed a faint discoloration at the apex; on the twenty-fifth day after the second irradiation, some of the teleutospores treated with the ultra-violet rays emitted a short promycelium from the discoloured part of the apical cell. There was, however, no subsequent formation of basidiospores. The proportion of spores which germinated was about 4 to 5 per cent.

The untreated controls and the teleutospores exposed to the X-rays showed no sign of germination even after being kept for one month in damp conditions.

The effect obtained with Wood's rays is considered to confirm the similar results published by Sibilia [*R.A.M.*, x, p. 171].

CHURCHWARD (J. G.). **Studies in the inheritance of resistance to bunt in a cross between Florence × Hard Federation Wheats.**—*Journ. & Proc. Roy. Soc. New South Wales*, lxiv, pp. 298–319, 1 graph, 1931.

While stating that wheat bunt (predominantly *Tilletia tritici* [*T. caries*]) in New South Wales is readily controlled by the dis-

infection of the seed-grain with copper carbonate, in spite of the fact that the three most popular varieties of wheat grown there are very liable to infection, the author points out the costliness of this method, estimates showing that approximately £70,000 were spent in that State in 1930 on seed disinfection alone. After a brief review of the work hitherto done in breeding bunt-resistant varieties [*R.A.M.*, ix, pp. 514, 515; x, p. 19], he gives details of his observations on the behaviour of the F_3 generation of a cross between the resistant Florence and the susceptible Hard Federation varieties at Glenfield in 1928. The results [which are presented in tabular and graphic forms] indicate the presence of a one factor difference for resistance to bunt between the two varieties, susceptibility acting as a dominant factor. In the F_3 generation the three classes, homozygous resistant, heterozygous susceptible, and homozygous susceptible, gave an approximation to a ratio of 1 : 2 : 1. In the cross studied, the inheritance of bunt resistance, production of grass tufts [sterile plants], and tip-beardedness appears to be controlled by simple independent Mendelian factors.

PETIT (A.). **La désinfection à sec des semences du Blé contre la carie.** [Dry disinfection of Wheat seed against bunt.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 6, pp. 224–226, 1931.

The author states that seed treatment with steatite dust containing 15 per cent. cupric chloride is not only highly efficacious against bunt [*Tilletia caries* and *T. foetens*] but is also very economical, this dust containing only about 5 per cent. copper, equivalent to 15 gm. of the metal per quintal of seed treated [*R.A.M.*, ix, p. 637]. Tests made under both experimental and field conditions during a period of three years using seed contaminated to the extent of 0·1 and 0·5 per cent. bunt spores gave only 0·2 and 0·7 per cent. bunted ears, for each lot of seed respectively, as compared with 33 and 61 per cent. bunt in the untreated controls. The corresponding figures for the two lots of contaminated seed when dusted with copper oxychloride (59 per cent. copper), neutral copper acetate (32 per cent. copper), basic copper carbonate (57 per cent. copper), and cupric steatite containing 30 per cent. cupric chloride (11·6 per cent. copper) were, respectively, 0·6 and 4·9, 2·2 and 10·8, 1·3 and 12·2, and 0·3 and 0·9 per cent.

Two tests made with cupric steatite dust containing 11 per cent. cupric chloride on oat seed contaminated with *Ustilago avenae* gave an average of only 1·5 per cent. smutted ears as compared with 11 per cent. in the untreated controls.

PASINETTI (L.). **Ricerche anatomo-fisiologiche sulla 'punta nera' del Frumento argentino 'San Martin'.** [Anatomical and physiological researches on black point of San Martin Argentine Wheat.]—*Riv. Pat. Veg.*, xxi, 5–6, pp. 145–156, 4 pl., 1931.

Wheat of the awned Argentine variety San Martin, stated to be affected with a form of black point [*R.A.M.*, i, p. 289], showed no external signs of disease on the ears, but revealed a blackening along about one-fourth of the base of the glumes, together with a

similar discoloration of the scutellum, extending to about one-third of the dorsal side of the grains. The ears themselves were of normal dimensions and completely developed. The disease was evidently similar to that described by Peyronel as 'puntatura' [ibid., v, p. 355] and not the ordinary (apical) form of black point.

Sections of the affected inflorescences showed no hyphae in the discoloured pericarp tissues. The discoloration was most marked in the region of the mesocarp and endocarp, especially in the sections made nearest the scutellum; it was also very marked in the two internal layers of the pericarp, though no hyphae were present. The aleurone layer revealed nothing abnormal, though the cells were very turgid. No trace of any abnormality or lesion could be detected in the tissues of the embryo.

Infected material sown on various media did not give a growth of any of the organisms usually associated with black point, while germination tests further demonstrated that the condition in no way adversely affected the germinability of the seed. Affected inflorescences gave rise to plants with perfectly healthy ears and grains.

The author concludes that the discoloration of the scutellum was not due to *Cladosporium*, *Alternaria*, *Helminthosporium*, or bacteria. In tissues other than those of the scutellum the discoloration spread in the mesocarp in the groove of the grain and up the sides of the groove for some distance. The condition is regarded as purely physiological and resulting from adverse environmental (perhaps climatic) conditions.

A bibliography of 16 titles is appended.

JESSEN (W.). **Die Marmorierung der Blätter der Getreidearten, eine Magnesiummangelerscheinung.** [The mottling of the leaves of cereal species, a magnesium deficiency phenomenon.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, A, xxii, 3–4, pp. 129–135, 3 figs., 1931.

Oats, wheat, rye, and barley growing on light, sandy soil with an admixture of clay at Dahlem, Berlin, and on acid soils in Pomerania and West Prussia are stated to develop a pronounced mottling, chlorosis, and rolling of the foliage, accompanied (in the case of barley) by symptoms closely resembling those of grey speck [*R.A.M.*, viii, p. 304]. Field and pot experiments [which are described and the data tabulated] showed that the condition in question is due to magnesium deficiency, resulting in metabolic disturbances associated with the excessive accumulation of ammonium nitrogen.

HONECKER (L.). **Beiträge zum Mehltauproblem bei der Gerste mit besonderer Berücksichtigung der züchterischen Seite.** [Contributions to the mildew problem in Barley with special reference to the selective aspect.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, viii, 3, pp. 78–84; 4, pp. 89–106, 10 figs., 1931.

A comprehensive and fully tabulated account is given of the writer's investigations and experiments at Weihenstephan, Bavaria,

on the reaction of a number of barley varieties to mildew (*Erysiphe graminis*) [*R.A.M.*, ix, p. 643], with special reference to the work of selection for resistance to this disease.

It was shown by qualitative analyses, conducted over an unbroken period of ten years, that the high degree of resistance in the Pflug's Intensiv variety is correlated with a low albumin content and abundant reserves of starch. The fact that in pot experiments this variety retained its turgescence after inoculation with *E. graminis*, while the susceptible Heils Franken H_1 was severely wilted, is considered to indicate that mildew infection is not the result but the cause of loss of turgor [cf. ibid., iv, pp. 108, 751].

Full details are given of inoculation experiments with conidial suspensions of the fungus on 306 standard barley varieties [which are enumerated]. At a mean room temperature of 10° C. the incubation period of the disease was 8 days, while at 17° it was only 4 days. Inoculations were made from 10th to 14th April, 1931, on 163 summer varieties (4 plants of each), all of which, with the exception of Pflug's Intensiv, which was immune, and *Hordeum commune* nud. pol. vulg. A. spur. (highly resistant), were in an advanced stage of infection by 24th May. Of the 10 Lithuanian varieties inoculated on 26th April, one plant of *H. distichum* [var.] *nutans* remained healthy while *H. zeocrithum* was only slightly infected, the remainder being heavily attacked. Eight plants each of a further 43 varieties were inoculated on 9th May and 16 each of another 11 on 11th May. Of these a fodder barley (75 a) from the Estanzuela (Uruguay) seed selection station showed considerable resistance, while another (72 d) of the same origin was slow in succumbing to infection and retained its green coloration longer than the other varieties. Of the 47 (mostly foreign) varieties inoculated on 12th May (8 plants of each), a high degree of resistance was shown by Sagira London Egypt and another lot of the Uruguayan fodder barley (75 a). All the 27 winter barley varieties tested proved highly susceptible to mildew.

The results [which are fully discussed] of hybridization experiments between the resistant Pflug's Intensiv and the susceptible Criewener 403 and Heil's Franken H_1 varieties showed that some of the plants were homozygous for resistance and others heterozygous, resistance being recessive.

SPITZER (G.) & DIEHM (M. M.). **Preliminary studies of the enzymes of Gibberella saubinetii.**—*Journ. Agric. Res.*, xliii, 3, pp. 223–229, 1931.

The studies briefly described in this paper indicated the presence in *Gibberella saubinetii* (grown on a medium consisting of 4 per cent. malt extract and 0·2 per cent. nitrate of soda) of the enzymes glucosidase, invertase, and lipase, while tests for urease, amylase, and cellulase failed to give positive results. The enzyme material obtained from mycelial growth of the fungus showed a decided catalase reaction, and its extract readily hydrolysed casein and gelatin at P_H 9 and 6, but not at 3, indicating the presence of proteolytic enzymes, especially trypsin and erepsin.

THIEME (P.). **Ueber Mutterkorn in Getreide, Mehl und Brot, seinen Nachweis und die Verhütung von Mutterkornvergiftungen.** [On ergot in cereals, flour, and bread, its detection, and the prevention of ergot poisoning.]—*Arb. Reichsgesundheitsamte*, lxiii, 1–2, pp. 211–250, 9 figs., 1931.

In this paper (reprinted from *Veröffentlichungen aus dem Gebiete der Medizinalverwaltung*, xxxiii, p. 1, 1930) a comprehensive account is given of the various clinical manifestations of ergot (*Claviceps purpurea*) poisoning, together with a brief history of the disease from the earliest times, medical and legal considerations, notes on recent epidemics, and the pharmacological, microscopic-histological, chemical, and spectroscopic methods of detecting the presence of the fungus in rye flour and bread [ibid., xi, p. 38].

A useful bibliography of 101 titles is appended, arranged under the various headings indicated above.

[NATTRASS (R. M.).] **The smut disease of Maize.**—*Cyprus Agric. Journ.*, xxvi, 3, pp. 81–82, 1 fig., 1931.

Attention is drawn to the occurrence of maize smut [*Ustilago zeae*] in various parts of Cyprus during 1931. The symptoms of the disease are briefly described in popular terms.

BAMBERG (R. H.). **Bacteria antibiotic to Ustilago zeae.**—*Phytopath.*, xxi, 9, pp. 881–890, 1 fig., 1 graph, 1931.

This is an expanded account of the writer's investigations on the action of a bacterium isolated from maize plants at St. Paul, Minnesota, in the prevention of normal infection by maize smut (*Ustilago zeae*) and the destruction of colonies of the fungus on artificial media [*R.A.M.*, ix, p. 373 and above, p. 98].

UPPAL (B. N.) & DESAI (M. K.). **The effectiveness of dust fungicides in controlling grain smut of Sorghum.**—*Agric. & Livestock in India*, i, 4, pp. 396–413, 1931.

A tabulated account is given of the writers' experiments from 1927 to 1930 in the control of grain smut (*Sphacelotheca sorghi*) of Nilva fodder sorghum in the Bombay Presidency by dust treatments [*R.A.M.*, x, p. 585].

Copper carbonate dust (53 per cent. copper) at the rate of 2 oz. or more to 60 lb. of seed-grain gave effective control of smut for all spore dosages, while even 1 oz. sufficed when the seed was not blackened with spores. The dust caused no injury to seed germination. Copper sulphate dust (British Sulphate of Copper Association, London) was equally effective with copper carbonate in the control of sorghum smut, but owing to its absorption of moisture from the air it does not retain its powdered form for long. Sulphur dust (Dharamsi Morarji Chemical Co., Bombay), however, gave the best results in smut control in district trials made throughout the Presidency, and is probably the most suitable for the purpose, being much cheaper than copper carbonate or copper sulphate. Of the two brands tried, 'fungus' sulphur (200-mesh) was slightly superior to sulphur-A (100-mesh) and gave very effective control when used at the rate of 3 to 4 oz. to 60 lb. seed-grain. Even at 20 oz. or more to 60 lb. it caused no

injury to the seed. The cost of sulphur treatment in the area under discussion is less than one pie [a fraction of a farthing] per acre. Buffalo calves fed on sulphur-dusted sorghum grain throve and showed a gain in weight.

UPPAL (B. N.). **India: Rhizoctonia bataticola on Sorghum in the Bombay Presidency.**—*Internat. Bull. of Plant Protect.*, v, 9, p. 163, 1931.

During the winter of 1930-1 the sorghum crop in the East Deccan, India, was extensively damaged by *Rhizoctonia bataticola* [*Macrophomina phaseoli*], which in many places reduced it to one quarter of the normal. This disease is also serious near Broach in Gujarat, where it is known as 'kharkharia'. Tobacco and cotton are also believed to be infected by the fungus in the latter district.

HAHNE (B.). **Report on inspection of packing-houses in various South African Citrus areas.**—*S. Africa Dept. of Agric. Bull.* 98, 20 pp., 1931.

In this paper (to which Dr. I. B. Pole Evans contributes a foreword under the title of 'Handling of Citrus fruits in relation to subsequent wastage') the writer gives full details of his inspections during 1930 of eight packing-houses in the citrus-growing regions of the Transvaal and Cape Province.

The main conclusion reached from an investigation of the conditions in the packing-houses is that the slight or extensive wastage occurring in each is due to preventable causes either in the grading and sizing machinery, in handling methods, or in the picking of the fruit and its conveyance to the packing-house. The practice of allowing the oranges to wilt for a week in order to show up insect stings was found to be responsible for a considerable development of blue and green moulds [*Penicillium italicum* and *P. digitatum*: *R.A.M.*, ix, p. 449; x, p. 517], the spores of which are ubiquitous and increase in numbers with the advance of the season. It was noticed that the grading belts and lifting rollers were covered with bluish-green patches, evidently as a result of mould impregnation from the decaying fruit. The only condition definitely requiring scientific investigation is considered to be the creasing and puffiness of the rind of the fruit which is prevalent in various parts of the Union and has not yet been correlated with any particular cultural, soil, or climatic factor [ibid., ix, p. 450]. A number of suggestions are made for improved methods of handling the fruit.

The export of Citrus fruit: recommendations by Citrus Preservation Committee.—*Journ. Australia Council Sci. & Indus. Res.*, iv, 2, pp. 96–99, 1931.

This paper gives the recommendations of the Australian Citrus Preservation Committee concerning the manner in which citrus fruit intended for export should be handled, the points dealt with including export regulations, type of fruit, methods of dealing with it in the grove and packing house, transport by rail and ship, pre-cooling, and general instructions. Where proper washing

facilities exist, the Committee advise immersing the fruit for 8 minutes in a 5 per cent. solution of sodium bicarbonate at 112° to 120° F. and subsequently drying on towel driers as a safeguard against infection by moulds [chiefly *Penicillium* spp.: *R.A.M.*, ix, p. 775; see also ibid., x, p. 451].

DOIDGE (ETHEL M.). **Sooty blotch in Oranges.**—*Farming in South Africa*, vi, 65, pp. 173–174, 2 figs., 1931.

Oranges in the so-called 'mist belt' of the northern Transvaal are liable to considerable disfigurement by sooty blotch (*Gloeodes pomigena*) [*R.A.M.*, xi, p. 21], which may be removed by either of the following processes. (1) The fruit should be dipped for two minutes in a 2·5 per cent. solution of bleaching powder containing 33 to 37 per cent. available chlorine, left to stand for 30 minutes, and then redipped, since the bleaching principle (calcium hypochlorite) becomes active after removal from the solution. The bleaching powder may be obtained at a cost of 13 shillings per 100 lb. f.o.r. Durban or 17*s.* 9*d.* f.o.r. Johannesburg, and the estimated cost of the treatment is one penny per case exclusive of labour. (2) Half a minute's immersion in full strength or 10 minutes at half strength Eau de Javelle (15 per cent. anhydrous potassium carbonate or 30 per cent. crystalline sodium carbonate solutions with 20 per cent. bleaching powder suspension). The latter treatment removed all trace of blotch, while two minutes at half strength also gave good results.

VAN DER PLANK (J. E.). **Exanthema of Citrus.**—*Farming in South Africa*, vi, 66, pp. 219–220, 4 figs., 1931.

The first case of exanthema in citrus [*R.A.M.*, x, p. 24] in South Africa was observed two years ago. The disease is now known to occur in the eastern Transvaal and Cape Province, being common near Bathurst. The symptoms of exanthema and their relations to cultural conditions are briefly discussed. They include severe stunting, very deep colouring of the leaves, brown, glossy, gum-soaked areas on the fruit (which is often pale yellow), blister-like pockets of amber-coloured gum on young shoots, the production of multiple buds, shortened internodes, and a bushy appearance of affected shoots.

THOMPSON (A.). **Stem-rot of the Oil Palm in Malaya.**—*Straits Settlements and Federated Malay States Dept. of Agric. Bull. Scient. Ser. 1931*, No. 6, 23 pp., 7 pl., 1931.

Further investigation of the serious stem disease of the oil palm (*Elaeis guineensis*) in Malaya, a preliminary note on which has already been noticed [*R.A.M.*, ix, p. 648], showed the condition to be associated with the following fungi: (*a*) a species of *Fomes* resembling *F. pachyphloeus* [ibid., viii, p. 292] but also like certain described forms of *F. lamaoensis*, which was invariably found on diseased palms, and the fructifications of which usually develop between the leaf bases; (*b*) *F. applanatus* [*Ganoderma applanatum*] which is fairly common on stumps and fallen timber all over the country; (*c*) *G. lucidum*; and (*d*) the conidial stage of *Ceratostomella paradoxa* [ibid., x, p. 525]. The last-named frequently

develops on the bases of leaves that are pruned off during harvest, but does not seem to penetrate as far as the stem tissue, and frequently only causes a central rot of about 2 inches deep ; when the diseased tissue finally dries up, however, it is soft and in a state likely to allow entry to drops of water carrying spores of parasitic fungi.

The work also included a study of the organisms in pure culture [some details of which are given], and inoculation experiments which, together with field observations, indicate that the *Fomes* resembling *F. pachyphloeus* is the probable cause of the disease, though the two species of *Ganoderma* may possibly act also as wound parasites. The paper terminates with a discussion of control measures, and recommendations for prevention and treatment of the disease.

AGOSTINI (ANGELA). **On Blastomycoides lanuginosus Castellani.** —*Journ. Trop. Med. & Hygiene,* xxxiv, 17, pp. 287–288, 2 figs., 1931.

An account is given of the writer's investigations on cultures of *Blastomycoides lanuginosus* [*R.A.M.*, x, p. 27] which were sent by Castellani from the United States to the Botanical Institute of the University of Pavia. Growth on various media is profuse, velvety, lanuginous, white at first and later slightly yellowish or brownish. The hyphae are hyaline, sparsely branched, septate, and 2 to 7 μ in thickness. The oblong, generally apiculate, hyaline, usually single aleurioconidia, 7 to 11 by 3 to 6 μ, are formed at the extremities of unbranched hyphae. Arthroconidia, measuring up to 15 or 18 μ in diameter, are usually present. The optimum temperature for growth is 25° to 30° C.

The genus *Blastomycoides* was placed by Castellani in the Oosporaceae [*R.A.M.*, viii, p. 103] which are, however, characterized by the formation of true conidia, whereas *B. lanuginosus* only produces aleurioconidia and should, therefore, be placed in Vuillemin's family Aleurismataceae. It is transferred to the genus *Glenospora* as *G. lanuginosa* n. comb.

NANNIZZI (A.). **'Glenosporella', nuovo genere di 'Hyphales'.** [*Glenosporella*, a new genus of the Hyphales.]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, vi, 3–4, pp. 268–273, 1931.

The author gives Latin diagnoses of the new genus *Glenosporella* Nannizzi 1931, *G. albiscicans* (Nieuwenhuis) Nannizzi, and *G. dermatitidis* Agostini [*R.A.M.*, x, p. 458]. He also proposes a modified classification of the Hyphomycetes into four sub-orders, viz., Thalloconidiales, Hemiconidiales, Aleurioconidiales, and Euconidiales, the propagative bodies of which are thalloconidia, hemiconidia, aleurioconidia, and euconidia, respectively.

DHAYAGUDE (R.). **Y a-t-il une électivité cutanée des teignes animales?** [Is there a cutaneous electivity in animal ringworms?]—*Ann. de Parasitol. Humaine et Comp.*, ix, 4, pp. 359–371, 1931.

The author claims to have established by experiments on guinea-pigs [some details of which are given], inoculated hypo-

dermically and intraperitoneally with spore suspensions of *Ctenomyces (Trichophyton) mentagrophytes* and *Sabouraudites felineus* [*R.A.M.*, x, p. 243], that these dermatophytes have no pathogenic action on any tissue of the animal's body, with the sole exception of the skin [cf. ibid., viii, p. 506]. Inoculation by this method never led to the development of lesions in the skin, even when the latter was scarified, whereas direct inoculation on the scarified skin was successful, except when done on the site of a fairly recent previous lesion that had healed spontaneously. It was also shown that hypodermic or intraperitoneal injections did not produce immunity from the disease or allergy in the animals.

MORSTATT (H.). **Degeneration bei Kulturpflanzen und die Frage ihres Vorkommens bei Sisal.** [Degeneration of cultivated plants and the question of its occurrence in Sisal.]—*Der Tropenpflanzer*, xxxiv, 3, pp. 95–99, 1931.

The recent increase of disease among the sisal [*Agave rigida* var. *sisalana*] plantings of Tanganyika [*R.A.M.*, x, p. 382] is widely attributed to ecological degeneration, but the writer finds that this theory is based on insufficient evidence. In his opinion, the phenomenon in question is associated with a temporary sequence of adverse climatic conditions, and not with any inherent tendency to deterioration.

THOROLD (C. A.). **Fusarium wilt disease of Sunn Hemp. II.**—*Trop. Agriculture*, viii, 7, pp. 176–177, 2 figs., 1931.

Continued investigation in 1929–30 of the wilt disease of sunn hemp [*Crotalaria juncea*] in Trinidad, attributed to a species of *Fusarium* which is considered probably to be a biological strain of *F. vasinfectum* [*R.A.M.*, x, p. 799], showed that the fungus does not infect cotton, cowpea, Bengal bean [*Mucuna aterrima*], sword bean [*Canavalia ensiformis*], or pigeon pea. Measurements of infected plots indicated that when a non-susceptible crop is grown the organism does not spread in the soil, but it has not yet been established whether a long rotation actually decreases the degree of soil infection; a rotation interval of 16 months in the experimental field did not have this effect. Observations further showed that on limed soil, giving an alkaline reaction, both the density of stand of sunn hemp and the percentage of wilt were increased, but this may have been due to the easier spread of the fungus in the soil, owing to more intimate root contact of the plants. The rate and distance of spread of infection from a given focus was found to be directly proportional to the intensity of infection at that centre. Manurial treatment was again shown to have no appreciable effect on the incidence of wilt.

WARE (W. M.). **A blossom wilt of Lavender caused by Botrytis cinerea.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxviii, pp. 206–210, 2 figs., 1931.

Lavender in Kent and Somerset is affected by a wilt in which, while the flower buds are still green or about to open, the stalks below the inflorescences shrink and turn brown, later drying up and causing the blossom heads to hang down limply. No other

part of the plants appears to be affected. When some of the stems were kept under moist conditions *Botrytis cinerea* developed on the affected parts.

In culture two strains of the organism were apparently isolated, as on the same medium one immediately formed conidiophores and the other sclerotia. The latter, which were eventually produced in both sets of cultures, germinated by producing tufts of conidiophores.

Five out of nine inoculations in which the mycelium of the fungus was introduced into cut or pricked flower stems of lavender gave positive results. Apparently the fungus, probably helped by enzyme action, produces the wilt very rapidly.

VAN BEYMA THOE KINGMA (F. H.) & VAN HELL (W. F.). **Ueber die Botrytiskrankheiten der Lilien.** [On the *Botrytis* diseases of Lilies.]—*Phytopath. Zeitschr.*, iii, 6, pp. 619–632, 6 figs., 1931.

The strain of *Botrytis elliptica* [*R.A.M.*, x, p. 667] isolated by van Beyma from *Lilium candidum* in Holland in 1928 forms no sclerotia [ibid., viii, p. 41], whereas a strain isolated by van Hell in 1930 from *L. umbellatum* produces these bodies and corresponds exactly with the species described by Wright in England in 1928 [ibid., viii, p. 106]. The results of inoculation experiments on lilies (*L. candidum* and different varieties of *L. umbellatum*) showed that van Hell's strain can destroy the plants entirely, while that originally isolated by van Beyma causes only slight injury. *B. hyacinthi* van Beyma [ibid., viii, p. 41], isolated from lily bulbs, also proved pathogenic in certain cases. Two strains of *B. cinerea* from lilies, one forming sclerotia, were found to be capable of producing leaf spots under favourable conditions. However, among these species of *Botrytis* the only virulent parasite is the sclerotium-forming strain of *B. elliptica*. In the absence of other morphological differences the production of sclerotia is not regarded as justifying the establishment of a new species.

NEWTON (W.) & HASTINGS (R. J.). **Botrytis tulipae (Lib.) Lind. I. The production of conidia as influenced by various factors.** —*Scient. Agric.*, xi, 12, pp. 820–824, 1931.

The results of cultural experiments with *Botrytis tulipae* [*R.A.M.*, x, p. 524] briefly described in this paper, indicated that among the factors that stimulate the production of conidia by this fungus the one most likely to be of practical importance under field conditions is low temperature; the spores were rarely produced above 25° C. This suggests the advisability of applying protective sprays to the foliage of tulips in early spring, particularly during cold spells. The disease is stated to be very prevalent in commercial bulb gardens of the coastal regions of British Columbia.

TAKIMOTO (S.). **Bacterial leaf spot of Iris.**—*Fungi* (*Nippon Fungological Soc.*), i, 1, pp. 21–24, 1 fig., 1931. [Japanese, with English summary.]

Bacterium iridicola Takimoto n. sp., causing a brown leaf spot

on *Iris tectorum* and *I. japonica* in Fukuoka, Japan, is a short rod with rounded ends, occurring singly or in pairs, measuring 1·2 to 2 by 0·7 to 0·8 μ and forming white, circular, raised, or convex colonies on beef agar; motile by one to three polar flagella; Gram-negative, liquefying gelatine, clearing milk without coagulation or reduction of litmus, forming neither acid nor gas from sugars, digesting starch; optimum temperature for growth 38° C., minimum 4°, thermal death point 51°.

LAUBERT (R.). **Eine sehr schädliche Krankheit der Daphne mezereum L.** [A very injurious disease of *Daphne mezereum* L.]—*Blumen- und Pflanzenbau*, xlvi, 9, pp. 138–139, 2 figs., 1931.

Young plants of *Daphne mezereum* sent to the Biologische Reichsanstalt, Berlin, for inspection showed a brown spotting of the upper and under side of the leaves, especially on the narrow basal portion, which was frequently quite discoloured, soft, and wilted. The spots were covered with waxy spore masses composed of the hyaline, elongated-obovate, uniseptate, slightly curved conidia, 15 to 25 μ long, of *Marssonina daphnes* (Desm. et Rob.) Magn. The fungus has been reported (on this host only) from France, Holland, and Germany.

THORNBERRY (H. H.) & ANDERSON (H. W.). **A bacterial disease of Barberry caused by Phytomonas berberidis, n.sp.**—*Journ. Agric. Res.*, xliii, 1, pp. 29–36, 1 pl., 4 figs., 1931.

The authors investigated a bacterial disease (the chief symptom of which is a severe leaf spotting with some defoliation) which is prevalent on the Japanese barberry (*Berberis thunbergii*) in the northern United States, and was also observed on *B. amurensis* [var.] *japonica*, *B. brevipaniculata*, and *B. vulgaris* in Illinois. The rounded or slightly angular spots are 2 to 5 mm. in diameter, dark green and water soaked when young, but soon turning dark purple. The disease also attacks the petioles and succulent shoots, the young spots resembling those on the leaves, though on ageing they elongate and in some cases girdle the twigs, causing a distinct terminal blight. Infection in one-year-old twigs prevents the development of their buds in the spring, the tissues of the deeper bark layers near the buds containing small dark streaks which may attain one cm. or more in length but are usually much shorter, sometimes mere dots. The bacteria appear to live over winter in these lesions, causing renewal of infection in the spring.

The causal organism, which is named *Phytomonas berberidis* n. sp. [a technical description of which is appended] is a short, motile, aerobic, Gram-positive, non-acid-fast, capsule-forming but not sporulating rod, 1·5 to 2·5 by 0·5 to 1 μ in diameter, with two to four polar flagella. On dextrose agar it forms smooth, pulvinate, entire, white, opaque colonies. It has no diastatic action, and failed to ferment the sugars, alcohols, and glucosides which were tested. It does not coagulate or peptonize litmus milk, and does not reduce the litmus. No hydrogen sulphide or indol are produced. The optimum, minimum, and maximum P_H values for its growth are 8·5, 4·8, and 9·6, respectively, and the optimum,

minimum, and maximum temperatures 18°, 7°, and 30° C. with the thermal death point at 50°.

There was some evidence that infection in the field occurs through the stomata and slight wounds on the leaves.

THORNBERRY (H. H.) & ANDERSON (H. W.). **Bacterial leaf spot of Viburnum.**—*Phytopath.*, xxi, 9, pp. 907–912, 4 figs., 1931.

Viburnum opulus, *V. tomentosum*, and *V. dentatum* at Illinois University were observed in May, 1929, to be infected by a bacterium causing an irregular brown spotting of the leaves, accompanied by inconspicuous shrunken lesions on the stems. The causal organism, to which the name *Phytomonas viburni* n. sp. is given, was readily isolated from the diseased tissues. It measures 1 to 2 by 0·5 to 1 μ, occurs mostly in pairs but sometimes singly or in short chains, and is motile by means of 2 to 4 polar flagella. The organism is non-acid-fast, Gram-positive, forms pale grey colonies on dextrose beef-extract agar, does not liquefy gelatine, ferment sugars, or reduce nitrates; the optimum, minimum, and maximum P_H for growth are 8·5, 4·8, and 10·4, respectively, the corresponding temperatures being 25°, 12°, and 35° C. The pathogen overwinters in cankers, in infected buds, and possibly in diseased leaf débris in the soil. Artificial inoculations on *V. opulus* produced typical lesions, and the organism was reisolated in pure culture.

ZELLER (S. M.). **A witches' broom of Ocean Spray (Holodiscus discolor).**—*Phytopath.*, xxi, 9, pp. 923–925, 1 fig., 1931.

Ocean spray (*Holodiscus discolor*), a rosaceous shrub native to the Pacific Northwest, was observed in 1925 to be affected by a witches' broom at Corvallis, Oregon, and subsequently the disease was found in other parts of the State and in Thurston County, Washington. Among the symptoms are increased production of thin, wiry lateral shoots; shortening of the internodes of the new shoots arising from the collar, which show little tendency to branching so that blossom clusters are usually absent; and dwarfing, crowding, and bronzing of the leaves. Experiments showed that the witches' broom symptoms may be induced by the budding of diseased nodes into healthy stems and the transfer of *Aphis spireae* from infected to healthy plants. The disease is believed to belong to the virus group.

[NATTRASS (R. M.).] **The white root rot of fruit trees.**—*Cyprus Agric. Journ.*, xxvi, 3, pp. 77–80, 3 figs., 1931.

Popular notes are given on the symptoms, life-history, and control of root rot of fruit trees (*Rosellinia necatrix*) [*R.A.M.*, vi, p. 560; xi, p. 24], which in Cyprus is stated to be particularly destructive on nursery seedlings. Young trees can sometimes be saved, in cases of mild infection, by pruning off the diseased roots and replanting in healthy soil. Treatment of the soil with a mixture of lime and sulphur (half and half), carbon bisulphide, or copper sulphate may be effective in conjunction with cultural measures [which are briefly indicated].

McClintock (J. A.). **The relation of canker treatment to fire-blight control.**—*Phytopath.*, xxi, 9, pp. 901–906, 3 figs., 1931.

Three bearing crab-apple trees of the Transcendent variety were treated with zinc chloride against fireblight (*Bacillus amylovorus*) [*R.A.M.*, vii, p. 791] in 1929 at the Tennessee Agricultural Experiment Station. The solution was used at the maximum strength of 53 per cent., the infected areas being painted for a distance of 8 to 12 inches beyond the external lesions. The application appeared to kill the organisms in the deep cankers involving the cambium as well as in the shallow ones. In the autumn of 1929 the three trees were free from untreated cankers, and in the following March they were enclosed in insect-proof cages. They then passed through the flowering period without developing blossom and twig blight, which was prevalent throughout eastern Tennessee. Twig blight was induced in one of the caged trees (a semi-dwarf) by placing a container full of diseased fruit spurs and young shoots on the screen covering the top of the case during a spell of wet weather in May. On 12th May, blighted blossom spurs and shoots from a Bartlett pear were placed on the case covering one of the Transcendent trees (a dwarf), two of the twigs of which developed infection following several rainy days.

These experiments are regarded as demonstrating the efficacy of the 53 per cent. zinc chloride solution in destroying the bacteria in hold-over cankers on apple trees, no appreciable injury to which resulted from the treatment.

Ogilvie (L.). **A fruit rot of Apples and Pears due to a variety of Phytophthora syringae.**—*Ann. Rept. Agric. & Hortic. Res. Stat., Long Ashton, Bristol, for 1930,* pp. 147–150, 2 pl., [1931].

During the autumn of 1929 a fruit rot of apples and pears somewhat resembling the brown rot due to *Monilia* [*Sclerotinia*] *fructigena* was very prevalent in the south-west of England. The affected apples showed light brown areas on the skin, rather like bruises, but not causing any flattening in the contour of the fruit. Inside, the affected part extended towards the core; it had brown striations marking the course of the vessels and was rather tough. On pears the affected areas were darker brown than on apple, with a well-defined edge, and the tissues were traversed by brown vascular striations.

From the affected parts a fungus was isolated which in culture on solid media formed sporangia of the *Phytophthora syringae* type but measuring (average of 17) 45·4 by 28·3 μ, the average measurements in water being 48·8 by 28·5 μ. The fungus is considered to be a stain of *P. syringae* distinct from the Irish strain of Lafferty and Pethybridge [*R.A.M.*, ii, p. 182].

From these facts, it appears that two *Phytophthora* fruit rots of apples and pears are prevalent in England, one caused by *P. cactorum* [ibid., ix, pp. 136, 392] the other due to this strain of *P. syringae*. The observations made at Long Ashton indicated that infection by *P. syringae* occurred largely from the soil and that sound fruits in contact with diseased ones readily became

infected after picking. The disease also developed in cold storage in about one month.

Control consists in preventing the fruit from coming into contact with the soil and frequently removing diseased fruit from the storage trays.

TURNER (H. A.) & DOWSON (W. J.). **The date and duration of the winter spore discharge of black spot.**—*Tasmanian Journ. of Agric.*, N.S., ii, 3, pp. 124–128, 1931.

Examination in the laboratory of a number of Cox's apple leaves, collected at random on 20th August, 1930, at Freshwater Point, Tasmania, showed that all bore immature perithecia of the black spot fungus (*Venturia inaequalis*). Five of these leaves, and two pear leaves with immature perithecia of *V. pirina*, were laid on the ground in the open at Launceston, with glass slides smeared with glycerine over them to catch the spores ejected from the perithecia after maturation. The first ascospores of *V. inaequalis* were caught on the 28th, after a heavy rain during the preceding night, and the first of *V. pirina* on the 9th September, showing that the latter had taken about ten days longer to mature than *V. inaequalis* under similar conditions. These observations are considered to indicate that, in the Tamar orchards, spores of *V. inaequalis* were present in the air by 27th August, and those of *V. pirina* by 8th September. The examination of the slides was continued until the leaves became disintegrated, and the results showed that while during dry periods no spores were discharged, after rain sufficiently heavy to drench the leaves, spores were emitted within a few hours. During the three months of the experiment, spore discharge occurred on sixteen separate occasions, starting before the dormant or green tip stage of the majority of apple varieties, and at the pink bud stage of most pear varieties, and continuing for at least three months.

These preliminary investigations show that everything possible should be done to bury the fallen leaves of apples and pears before the green tip stage; the ground should then be left without cultivation for as long as possible, i.e., until at least two control sprayings have taken place. The sprayings should be started early, not later than the green tip stage.

MARSH (R. W.). **Spraying trials against Apple and Pear scab at Long Ashton. III. Season 1930.**—*Ann. Rept. Agric. & Hortic. Res. Stat., Long Ashton, Bristol, for 1930*, pp. 151–161, [1931].

The continuation of experiments in the control of apple scab [*Venturia inaequalis*] at Long Ashton [cf. *R.A.M.*, ix, p. 724] for the third year in succession afforded striking evidence of the cumulative effect of spraying. Thus, although the weather was more favourable to scab infection than in either of the two years previously, a plot of 96 Lane's Prince Albert trees, although not sprayed at all in 1930, gave 95·3 per cent. clean fruit; a plot of Allingtons after one application of lime-sulphur (1 in 60) gave 98 per cent. scab-free fruit. This high degree of control is believed to result from the fact that the trees were almost freed from scab

in 1928 and were kept completely free in 1929. In consequence, no opportunity was afforded for wood infections during 1929 and the source of a spring outbreak was eliminated [ibid., xi, p. 49]. On a plot of Newtons and Grieves where scab had been allowed to develop in 1929, two pre-blossom sprays and one post-blossom resulted in completely clean crops in 1930. On pear varieties, one pre-blossom and one post-blossom (half-strength) application of Bordeaux mixture gave 98·5 per cent. clean fruit without causing injury.

The addition of aluminium sulphate to lime-sulphur did not obviate sulphur damage to Lane's Prince Albert apples, and on this variety all spraying against scab should be effected before blossoming. On Worcester Pearmain russeting followed a post-blossom spray with half-strength Bordeaux, and apples of this variety should therefore be given a pre-blossom spray of 1 in 60 lime-sulphur.

The use of spray guns with a power outfit reduced the time spent in spraying by 33 to 50 per cent., as compared with the time taken when lances were employed; the gun spraying caused no increase in spray damage.

The cost of the apple spraying was about the same as in 1929 and worked out at $1\frac{1}{4}d.$ per tree for one application of lime-sulphur, while the combined cost of the two applications of Bordeaux mixture given to pears seven years planted amounted to about the same.

Bagenal (N. B.), Goodwin (W.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab. I. Bramley's Seedling.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxviii, pp. 188–195, 2 figs., 1 plan, 1931.

Tests conducted during 1924 and 1925 at Marden, Kent, in the control of scab [*Venturia inaequalis*] on Bramley's Seedling apples by applications of various sprays [cf. *R.A.M.*, ix, pp. 790, 791] gave the following results. In the former year the plot sprayed three times with home-made Bordeaux mixture (8–25–100) gave 69·6 per cent. (by weight) clean apples while in 1925 the corresponding figure was 68·5 per cent., these results representing an increased yield of clean fruit of 41 and 40·2 per cent., respectively, over the unsprayed controls, and of 20·7 and 10·7 per cent., respectively, over the plot sprayed three times with 1 in 30 lime-sulphur. The plot sprayed three times with Bordeaux mixture, compared with the plot sprayed twice, showed an increased percentage of clean fruit of 20·8 in 1924 and 15·2 in 1925. The plot sprayed three times with lime-sulphur as compared with the plot sprayed twice showed an increased percentage in 1925 of 23·8 clean fruit. No increased fungicidal power resulted in either year when lead arsenate was added to lime-sulphur, and no scorching of any commercial importance resulted from any of the treatments.

Goodwin (W.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab. II. Allington Pippin and Newton Wonder.**—*Journ.-South Eastern Agric. Coll., Wye, Kent*, xxviii, pp. 196–205, 2 figs., 1931.

In further spraying tests against apple scab [*Venturia inaequalis*:

see preceding extract] conducted in Kent in 1930, Allington Pippin apples sprayed three times with home-made Bordeaux mixture (8–12–100) gave only 15 per cent. scabbed apples. When the trees were sprayed at the pink bud stage with Bordeaux mixture and this was followed by two post-blossom applications of 1 in 60 lime-sulphur, 22 per cent. of the apples were scabbed. The corresponding figures for the three unsprayed control plots were 73, 76, and 76.

Newton Wonder trees after three applications of Bordeaux mixture gave 26 per cent. scabbed apples, while following an application of Bordeaux mixture at the pink bud stage and one post-blossom application of 1 in 60 lime-sulphur they yielded 81 per cent. scabbed fruit, the corresponding figures for three unsprayed control plots being 88, 85, and 91.

The application of 1 in 60 lime-sulphur immediately after petal fall caused serious defoliation on the Newton Wonder trees but resulted in little damage to the Allington Pippins. Two post-blossom applications of lime-sulphur after a pre-blossom application of Bordeaux mixture gave no better finish to Allington Pippin apples than did three applications of Bordeaux mixture. No russeting of commercial importance was produced by the Bordeaux mixture on Allington Pippin and none at all on Newton Wonder.

BIRMINGHAM (W. A.). **Black spot or scab of Apple. Experiments for its control in New South Wales.**—*Agric. Gaz. New South Wales*, xlii, 8, pp. 635–640, 5 figs., 1931.

After giving a brief account of the considerable economic importance of apple black spot or scab (*Venturia inaequalis*) in New South Wales, the author gives a summary description of the symptoms and an outline of the life-history of the causal fungus, and also formulates a control schedule applicable to the local conditions in that State.

[DOWSON (W. J.)]. **Apple leaf-spot.**—*Tasmanian Journ. of Agric.*, N.S., ii, 2, pp. 79–80, 1931.

The author states that of recent years certain apple varieties (e.g., Cox's Orange Pippin, Jonathan, Scarlets, and Sturmer Pippin) in Tasmania have been observed to be liable to a leaf spotting which may appear early or late in the season; the spots are of various tinges of grey, brown, and purplish, and may be circular, rounded, or irregular. Some are found in the middle of the leaves, while others are confined to the edge and tips, and in Sturmers, besides spotting of the surface, the leaf margins darken to purple or bronze and curl upwards. The grey spots are due to *Phyllosticta pirina* [*R.A.M.*, ix, p. 487], and some of the rounded brown spots are caused by *Sphaeropsis malorum* [*Physalospora cydoniae*: ibid., ix, p. 41], but it is pointed out that both fungi are commonly found growing on leaves injured by sprays or on trees in a bad condition of health. The results of one year's investigation of the trouble indicate that it is not due to any one single cause, but to a combination of factors, among which potash deficiency [ibid., xi, p. 56] appears to play a predominant part, since in orchards where potash fertilizers are used regularly and in sufficient quantity, the

spotting is practically unknown. Another important factor is the scorching effect on the foliage of certain sprays. The preliminary preventive measures recommended are that Bordeaux mixture should only be used as a dormant spray (at the 'green tip' stage), and that lime-sulphur and arsenate of lead should not be applied during hot, sunny weather, nor as a mixed spray; and finally the affected trees should be tested for potash deficiency by applications of sulphate of potash at the rate of 3 cwt. per acre.

[Dowson (W. J.)]. **A note on the wood infection of Pear by black spot.**—*Tasmanian Journ. of Agric.*, N.S., ii, 3, p. 128, 1931.

The author states that a striking difference in Tasmania between the black spot [scab] of apple [*Venturia inaequalis*] and of pear (*V. pirina*) is that the latter organism frequently attacks the current season's wood of the pear trees, causing infections of the leaves and fruit during late summer. The spots on the wood form small black blisters, about one-eighth inch in diameter, either scattered along the shoot or massed together at its base. On older wood the blisters expand into small, roughened, black cankers. Emphasis is laid on the importance of this source of infection at a time when sprayings are practically over; the best protection against it is a careful pruning out of all current year's growth bearing the blisters, even at the cost of sacrificing some fruit wood.

Cooley (J. S. & Crenshaw (J. H.). **Control of Botrytis rot of Pears with chemically treated wrappers.**—*U.S. Dept. of Agric. Circ.* 177, 9 pp., 5 figs., 1931.

A species of *Botrytis*, probably *B. cinerea*, causes a serious storage rot of apples and pears in the Pacific Northwest, infection spreading through ordinary wrappers to sound fruits in contact with decaying ones. The spread of the rot has been controlled on Winter Nelis, Easter Beurre, and Anjou pears by the use of wrappers impregnated with a 2·5 per cent. solution of copper sulphate, the dry wrapper carrying about 1·4 per cent. of its dry weight in metallic copper in the form of copper sulphate. Preliminary experiments further indicate that the decay may be effectively controlled by the use of oiled paper wrappers impregnated with copper sulphate. No significant injury to the fruit was caused by this treatment in 30,000 boxes of the 1930 crop of Anjou pears [cf. *R.A.M.*, xi, p. 57].

Dippenaar (B. J.). **Anthracnose disease of Almonds.**—*Farming in South Africa*, vi, 64, pp. 133–134, 3 figs., 1931.

Almond trees in South Africa are liable to infection by *Gloeosporium amygdalinum* [*R.A.M.*, vi, p. 422], which chiefly attacks the fruit but also occurs on the twigs, shoots, leaves, and even on the flower-petals under moist conditions. The fungus forms yellowish-brown, sunken spots, 1 to 1·5 cm. in diameter; rotting of the kernel follows penetration, which may also be accompanied, in severe cases, by exudation of gum and mummification of the fruit. On half- to full-grown fruit the minute, brown specks produced by the fungus are partially hidden by hairs. Another feature of the anthracnose disease is the defoliation of young twigs

(up to one year old). Leaf infection (for which a large amount of moisture is necessary) is characterized by the development of water soaked areas at the tips and margins and bleaching of the tissues; all the leaves from a single bud may be killed. The Paper Shell and I.X.L. varieties show greater resistance than Jordan and Nonpareil. Some benefit was derived in 1930 from spraying with Bordeaux mixture or lime-sulphur on 31st July and 10th September, but two further applications are recommended to ensure complete control.

ILLINGWORTH (J. F.). **Yellow spot of Pineapples in Hawaii.**—*Phytopath.*, xxi, 9, pp. 865–880, 7 figs., 2 diags., 1 graph, 1931.

The initial symptom of yellow spot of young pineapples [*R.A.M.*, xi, p. 78], which has occurred in a destructive form in Hawaii since 1926, is a slightly raised, yellowish spot, $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter, on the upper surface of the leaf. At maturity the darker centre is surrounded by a yellow halo. The available evidence indicates that insect infection takes place near the centre of the plant, since the initial spots develop on the leaves of the third or fourth whorl from the centre. Under conditions favouring the disease, a yellow streak develops immediately below the initial spot, widening in the region of the white tissue at the leaf base. This streak tends to become constricted into circular yellow blotches, giving it the appearance of a chain of beads. The portion of the streak in the white tissue at the leaf base soon assumes a water soaked aspect, and when moisture is present in the leaf axils decay rapidly extends to the stem. A few days later the typical bead-like chain may be observed extending up the leaf next above the one first affected, and usually the remaining central leaves also become involved. Stem growth ceases at the point where the tissue is infected, and the normal development of the healthy part on the opposite side soon causes a decided bending over of the plant, a symptom that suggested the name of 'side rot' for the disturbance.

Humidity was found to be a most important factor in the acceleration of the disease, which may be retarded for months by drought. In 1929 the suggestion was first made that yellow spot might be a virus disease with some weed as a host, and the first evidence of transmission in cages was obtained when mosaic-diseased plants of *Crotalaria* were introduced, for about a month later typical yellow spot developed on the caged pineapples. *Thrips tabaci* was strongly suspected as the vector when the author ceased work and he states in a footnote that M. B. Linford subsequently finally established that this insect transmits the disease [ibid., x, p. 474].

PASSALACQUA (T.). **Una epidemia di 'brusone' del Nespolo del Giappone ('Eriobotrya japonica' Lindl.) dovuta al 'Bacillus amylovorus' (Burrill) Trevisan.** [An epidemic of blight of the Loquat (*Eriobotrya japonica* Lindl.) due to *Bacillus amylovorus* (Burrill) Trevisan.]—*Riv. Pat. Veg.*, xxi, 5–6, pp. 157–160, 1931.

In February, 1931, the author received from the vicinity of

Palermo, where the disease, known for some years, had then reached epidemic proportions and was causing heavy losses to growers, branches and fruits of loquat trees (*Eriobotrya japonica*) affected with fireblight (*Bacillus amylovorus*) [*R.A.M.*, iii, p. 380; vi, p. 175]. The condition rather resembled that commonly caused on pears by the same organism, the fruits developing with difficulty and showing a sort of rachitis.

Blackish spots were present on the fruit, both internally and in the vicinity of the remains of the calyx, suggesting that the disease had been present in the flowers. Later, the spots spread over the entire pericarp, causing the development of suberized areas. The pulp shrivelled and the fruit became mummified. The peduncles and the secondary and primary axes of the inflorescences withered, while the apical parts of the twigs were blackened and undeveloped. The leaves appeared to be unaffected.

The affected cells contained numerous bacteria. Infection penetrated to the seed coat but the reserve tissues were not attacked. The tissues adjoining the remains of the calyx were completely necrosed. In the inflorescence stalks the disease had reached the cambium but the xylem was unaffected. From diseased parts the author isolated *B. amylovorus*, the dimensions of which he gives as 1 to 1·5 by 0·8 to 1 μ, optimum temperature 28 to 30° C., thermal death point 50 to 55°.

Attempts to reproduce the disease on loquats in the Botanic Garden at Palermo gave negative results, probably owing to unsatisfactory experimental conditions.

Gram (E.), Christensen (A.), Greve (M.), & Poulsen (A.). **Maskiner til Bejdsning af Korn og Frø.** [Machines for grain and seed disinfection.]—*Statens Redskabsprøver Beretning* 63, pp. 16–33, 3 figs., 1 diag., 1931.

The continuously working seed disinfection apparatus 'Germator', manufactured by the M.I.A.G., Mühlenbau u. Industrie A.G. Werke, Brunswick (Danish agent, E. Olsen, Jagtvej 179, Copenhagen Str.), is stated to have given excellent results in tests of beet seed treatment with dahmit [*R.A.M.*, x, p. 90] carried out in Denmark during 1930–1 and to be superior to any other machine of a similar type on the Danish market. The machine, which costs Kr. 975, is constructed for the short disinfection process [ibid., x, p. 445].

Satisfactory results were also given by the 'Triumph' apparatus, manufactured by P. Lübke, Breslau (Danish agents, P. F. Røhde and Søn, Roskilde, price Kr. 650), in the treatment of beet seed and barley seed-grain with germisan.

Puntoni (V.). **Infestation des cultures de champignons par des acariens du genre Tarsonemus. Préservation de ces cultures.** [Infestation of cultures of fungi by acarids of the genus *Tarsonemus*. Preservation of such cultures.]—*Ann. de Parasitol. Humaine et Comp.*, ix, 4, pp. 359–362, 1 fig., 1931.

The fact that over 25 per cent. of some 70 cultures of various fungi which were sent in 1930 to the Bacteriological Laboratory

of the University of Rome were found to be heavily infested by a mite provisionally considered to be a variety of *Tarsonemus floricolus*, led the author to investigate the possibility of ridding such cultures of this pest and of preventing the spread of the latter to further cultures. The first aim was successfully attained by impregnating the cotton wool plugs of the culture tubes with xylol or, preferably, because of its less offensive smell, with rectified benzene, which by its vapours killed the mites in five or six minutes without any injury to the cultures. The spread of the pest to fresh culture tubes, in spite of its abundant presence in the laboratory, was prevented by soaking the ordinary cotton wool plugs in petroleum, pressing out with the hand, and leaving to dry in the air until apparent desiccation before use; the faint traces of petroleum remaining in the cotton wool were sufficient to prevent the mite from passing through it to 200 cultures thus treated, while 14 control tubes, kept under the same conditions, were all infected.

DICKINSON (S.). **Experiments on the physiology and genetics of the smut fungi. Cultural characters. Part II. The effect of certain external conditions on their segregation.**—*Proc. Roy. Soc. London*, Ser. B, cviii, B. 758, pp. 395–423, 1931.

In continuation of his study of the segregation of cultural characters in *Ustilago kolleri* [*R.A.M.*, viii, p. 298], the author describes and discusses in detail experiments to establish the influence of external factors on this process. Using the same technique as in his previous work, he demonstrated the presence in this organism of seven pairs of independent characters, two of which (gender and size of colony margin) are always segregated in the promycelium of the germinating chlamydospores in a 2 : 2 ratio, one (colour of the colony) is segregated at times in 2 : 1 : 1 and 4 : 0 ratios, and one (type of colony centre) is variously segregated in 2 : 1 : 1, 1 : 2 : 1, 3 : 1, and 4 : 0 ratios. He considers the character pairs gender and margin size to be each the expression of one pair of Mendelian factors, colour as the expression of two additive linked pairs, and type of colony centre as the expression of a number of pairs.

There was evidence that the linkage between the two colour factor pairs may be altered by changes in the concentration in the culture medium of the source of nitrogen, which also altered the percentage number of times four of the seven pairs of characters are segregated in a particular nuclear division, but had no effect on the haphazard distribution of the members of all seven pairs of segregating characters. On general lines the effect of increasing the concentration of the nitrogen source was to extend the process of segregation from one to two or three nuclear divisions, although segregation may occur in two non-consecutive divisions. The percentage segregation of gender is altered by four other external factors, namely, concentration of the medium, concentration of the carbohydrate source, hydrogen-ion concentration, and temperature; these factors, however, do not alter the haphazard segregation of gender.

The results of the investigation are considered to show that the

beginning and duration of the process of meiosis, as measured in nuclear divisions, is in part controlled by the external environment of the cell.

COONS (G. H.) & STRONG (M[IRIAM] C.). **The diagnosis of species of Fusarium by use of growth-inhibiting substances in the culture medium.**—*Michigan Agric. Exper. Stat. Tech. Bull.* 115, 7 pl., 1931.

Continuing their investigations on laboratory methods for the diagnosis of species of *Fusarium* [*R.A.M.*, viii, p. 520], the authors tested the reaction of 54 species and varieties to certain aniline dyes, of which the triphenylmethane group proved most useful, while acriflavine and copper sulphate were also promising. A key is given to the species, based on their responses to the dyes, the data relating to which are shown in 18 tables.

It would appear, from a consideration of these readings, that the broad limits indicated by the main divisions and major subdivisions in the keys denote the reaction to be expected from an organism which a specialist in the diagnosis of *Fusarium* would assign to the species indicated. For instance, true *F. eumartii* or *F. cubense* cultures may be expected to show extreme sensitiveness to malachite green and crystal violet, while *F. niveum*, *F. lycopersici*, and *F. vasinfectum* occupy an intermediate position, in respect of their response to malachite green, between the above-named highly sensitive organisms and the moderately sensitive *F. oxysporum*. *F. solani* and its allies, on the other hand, are readily distinguishable from the foregoing by their tolerance of malachite green and crystal violet, whereas a differentiation on morphological grounds is very difficult. Many repetitions of the tests over a period of several years indicated that approximately identical results were obtained each time.

RAISTRICK (H.), BIRKINSHAW (J. H.), CHARLES (J. H. V.), CLUTTERBUCK (P. W.), COYNE (F. P.), HETHERINGTON (A. C.), LILLY (C. H.), RINTOUL (M. L.), RINTOUL (W.), ROBINSON (R.), STOYLE (J. A. R.), THOM (C.), & YOUNG (W.). **Studies in the biochemistry of micro-organisms.**—*Phil. Trans. Roy. Soc. London*, Ser. B, ccxx, pp. 1–367, 3 diags., 1931.

A comprehensive and fully tabulated account is given of the studies conducted by the authors in the biochemistry of micro-organisms. The following are among the aspects under which the subject was considered: (1) quantitative methods and technique of investigation of the metabolic products of micro-organisms; (2) quantitative examination by the carbon balance sheet method [the application of which is fully described] of the types of products formed from glucose by species of *Aspergillus*, *Penicillium* (including *Citromyces*), *Fusarium*, and miscellaneous species of fungi; (3) production of mannitol from glucose by species of *Aspergillus*; (4) production of citromycetin and citrinin, new yellow colouring matters, from glucose by species of Wehmer's *Citromyces* group and *P. citrinum* Thom, respectively; (5) production of a new methoxy-dihydroxy-toluquinone from glucose by

species of *Penicillium* of the *P. spinulosum* series; (6) production from glucose by *P. spiculisporum* Lehman of a new polybasic fatty acid, $C_{17}H_{28}O_6$; (7) products of glucose metabolism formed by various species of fungi; (8) biochemical characters of *P. digitatum* and *P. italicum*, responsible for the rot of citrus fruits [see above, p. 104].

P. digitatum is stated to be unique among the species investigated in the fact that it produces from glucose considerable amounts of ethyl acetate. It further produces ethyl alcohol and a new polysaccharide giving rise to glucose on hydrolysis. *P. italicum* forms from glucose a new metabolic product characterized by its colour reactions with ferric chloride and bleaching powder which are diagnostic for the species.

NEUWEILER (E.). **Kartoffelanbauversuche der Vereinigung Schweizerischer Versuchs- und Vermittlungsstellen für Saatkartoffeln. Dritte Mitteilung der eidgenössichen landwirtschaftlichen Versuchsanstalt Oerlikon.** [Potato cultivation experiments of the Association of Swiss Experiment Stations and Agencies for Seed Potatoes. Third communication of the Federal Agricultural Experiment Station Oerlikon.] —*Landw. Jahrb. der Schweiz*, xlv, 4, pp. 513–538, 1931.

In experiments in various parts of Switzerland in 1929 and 1930 (16 in each year) it was observed that the incidence of virus diseases (leaf roll and mosaic) was higher on heavy soils. Among the early varieties the percentage increased from 19 in the former to 32 in the latter year, among the medium-early from 28 to 30, and among the late from 6 to 25 per cent. A distinct correlation was detected between the prevalence of virus diseases and decline of yield in the early varieties Goldball and Lichtblick, the medium-early King George V and Sonnenragis, and the late Feuerragis, Wekaragis, and Fulda.

Notes are given on the reaction to wart disease [*Synchytrium endobioticum*: *R.A.M.*, viii, p. 123; x, p. 544] of the varieties used in the tests.

The 'practical' tests in 1929 (41) and 1930 (37) were conducted with varieties that had given satisfactory results as regards yield in the above-mentioned trials. There was again a high incidence of virus diseases in the early varieties, Kuckuck and Eerstelingen [Duke of York] and the medium-early Alma, the percentages increasing from 11, 0·5, and 16·7, respectively, in 1929 to 42, 31, and 62, respectively, in 1930. Even among the later varieties there was an increased incidence of virus diseases in 1930 (4 to 12 compared with 0·6 to 5 per cent. in 1929).

In a series of tests conducted from 1928 to 1930 to determine the suitability of certain varieties for cultivation in mountainous regions, it was found that severe virus infections occurred in all those used at Villa-Vedretto, Ticino (1,380 m. above sea level), the amounts reaching 75, 70, 40, and 45 per cent., respectively, in Alma, Heimat (Böhm), Industrie, and Centifolia (v. Kameke) in 1930. Generally speaking, however, the two last-named varieties are well adapted for cultivation at high altitudes.

VERPLANCKE (G.). **Les maladies de dégénérescence de la Pomme de terre.** [Degeneration diseases of the Potato.]—*Journ. Soc. Centr. d'Agric. de Belgique*, xi, 6, pp. 138–167, 1931.

After briefly indicating the symptoms shown by the chief forms of degeneration diseases of the potato, the author discusses the various theories held by different authorities as to the origin of these conditions and indicates the effects exercised upon them by such environmental factors as soil, prevailing temperature, date of planting, altitude, and varietal resistance. A brief indication is given of the prevalence and severity of mild, rugose, and aucuba mosaic, leaf roll, streak, and mottling in the different potato-growing areas in Belgium, and the paper concludes with a discussion of the possibility of organizing local centres of seed selection.

BREHMER [W. v.] & ROCHLIN (EMILIA). **Histologische und mikrochemische Untersuchungen über pathologische Gewebeveränderungen viruskranker Kartoffelstauden.** [Histological and microchemical investigations on pathological tissue changes in virus-diseased Potato plants.]—*Phytopath. Zeitschr.*, iii, 5, pp. 471–498, 6 figs., 1931.

The writers' joint investigations at the anatomical laboratory of the Biologische Reichsanstalt, Berlin, are stated to have been undertaken mainly to determine the applicability of the methods used by the first-named in the differentiation of phloem necrosis, phloem necrobiosis, and obliteration of the phloem of leaf roll potato plants to the pathological changes observed by the junior author in those affected by mosaic and other virus diseases [*R.A.M.*, x, p. 264].

It was found that all potato plants, whether healthy or diseased, are liable to necrobiotic modifications. At first the necrobiotic sieve-tubes remain alive notwithstanding the swelling of the walls, but they die when this process involves the occlusion of the lumen. Pronounced necrobiotic swelling of the walls may be induced by abnormal environmental conditions. The symptoms, for instance, of nutritional disturbance in potato plants may resemble more or less closely those of virus diseases.

On the other hand, necrotic tissue changes are peculiar to virus-diseased plants, for the anatomical recognition of which they serve as diagnostic characters. Such alterations, which may occur in other parenchymatous tissues besides the phloem, are totally independent of vegetative influences and other external conditions. They cannot be induced either by drought or moisture, abundance or deficiency of manure, or by different kinds of soil. The necrosed cells, especially sieve-tubes and companion cells, collapse and those surrounding them are stretched to a corresponding extent. This stretching of the cells does not occur in necrobiosis. Accompanying the necrotic disorganization are the typical characters of the virus diseases, e.g., leaf rolling and curling, cauliflower-like distortions, and so forth. The necrotic tissue alterations are produced by organisms that destroy the cell contents and cause the death of the cell or cell complexes [ibid., ix, p. 799]. The pathological manifestations arising from this type of necrosis are irreversible.

Yellow discolorations develop in the necrotic tissue which are attributable, not to lignin deposits (lignification) but to the infiltration of fatty acids (suberization). Reliable indicators for necrotic tissue are Millon's reagent, Mäule's reaction, alcoholic phloroglucin solution, and extinction in polarized light, in which the walls of necrobiosed cells and ordinary cellulose membranes are strongly illuminated.

Obliterations of the phloem and cortical parenchyma are typical manifestations of senility in no way connected with virus diseases, necrosis, or leaf rolling induced by nutritional disturbances in the plant.

The cell contents of the necrotic tissues were found to be more acid than those of the adjacent healthy ones.

OLDAKER (C. E. W.). **Potatoes. Virus diseases and seed selection.**—*Tasmanian Journ. of Agric.*, N.S., ii, 2, pp. 91–92, 1931.

As exemplifying the good results of the educational campaign of the Tasmanian Department of Agriculture for the elimination from that island of potato virus diseases [*R.A.M.*, ix, p. 332], the author cites the case of two potato growers, one of whom succeeded by a drastic removal from his crop of about 50 per cent. of undesirable plants in producing the next year a crop showing a probable maximum of 15 per cent. of unsatisfactory plants, as against nearly 100 per cent. produced by seed tubers drawn from a district known to be capable of supplying good strains. The other grower, by strict selection of the mother plants, has succeeded in producing two small plots of 'Medium-top Brownell' and 'Big-top', in which there is no trace whatever of virus disease and all the plants are uniform in size and appearance.

ROBERTSON (I. M.) & SMITH (A. M.). **A study of the hydrogen-ion concentration of the Potato tuber.**—*Biochem. Journ.*, xxv, 3, pp. 763–769, 1931.

The following values were obtained in a comparative investigation of the hydrogen-ion concentration of healthy and diseased potato tubers: corky scab (*Spongospora subterranea*) on Great Scot, normal tuber P_H 5·70, diseased areas 4·35; common scab (*Actinomyces scabies*) on Duke of York, P_H 5·75 and 4·58, respectively; sprain (*Bacterium rubefaciens*) [*R.A.M.*, viii, p. 594] on Epicure, P_H 5·73 and 5·60; blackleg (*Bacillus atrosepticus*) [*B. phytophthorus*] on Epicure, P_H 5·73 and 5·65; blight (*Phytophthora infestans*) on Duke of York, P_H 5·75 and 5·83 (for fresh lesions) or 5·38 (for old ones); wart (*Synchytrium endobioticum*) on Duke of York, P_H 5·75 and 5·02; mosaic, crinkle, and leaf roll on Ally, healthy tubers, P_H 5·80, diseased 5·70, 5·60, and 5·85, respectively; mosaic and leaf roll on Arran Comrade, healthy tubers, P_H 5·64, diseased 5·47 and 5·70, respectively.

WAGER (V. A.). **Bacterial wilt of Potatoes.**—*Farming in South Africa*, vi, 62, pp. 63–64, 3 figs., 1931.

Bacterial wilt of potatoes (*Bacterium solanacearum*) is stated to be common in most parts of South Africa. Only a few cases of

this disease [the symptoms of which are briefly described] have been found on tobacco in South Africa, but it occurs in a severe form on tomato and causes wilting of groundnuts, eggplants, and pepper [*Capsicum annuum*]; some common weeds, e.g., *Datura stramonium* and *Physalis minima* are also susceptible. The best growth of the organism occurs at about 95° F. The primary source of infection by bacterial wilt in South African potatoes appears to be the use of diseased seed-tubers. In infested soil the organisms enter the plants through the roots, especially if these are injured in transplanting (tomatoes), or by the attacks of cutworms and eelworms. Infection is further disseminated by leaf-eating insects feeding first on diseased and then on healthy plants. Another dangerous source of infection is irrigation water. Preventive measures are concisely indicated.

WAGER (V. A.). **Common scab of Potatoes.**—*Farming in South Africa*, vi, 61, pp. 21–22, 2 figs., 1931.

A brief, popular account is given of potato scab (*Actinomyces scabies*), a disease of common occurrence in South Africa, with directions for its control.

VERPLANCKE (G.). **Étude cytologique des verrues de la Pomme de terre attaquée par le Synchytrium endobioticum Schilb.** [Cytological study of the warts of potatoes attacked by *Synchytrium endobioticum* Schilb.]—*Comptes rendus Congrès National des Sciences 1930*, Bruxelles, pp. 671–675, 11 figs., [? 1931].

The author states that the comparative cytological study of normal tissue from potato tubers (Industrie de Pologne variety) and of diseased tissue from tubers affected with wart disease (*Synchytrium endobioticum*) showed the presence of the following abnormalities in the cells of the latter. Some giant cells in the warts were found to be in a state of triploid and tetraploid division (polyploidy), with considerably larger nuclei, but with normally shaped chromosomes. Other cells were plurinuclear, and finally, the liquid in the cell vacuome forms a distinct black precipitate under the action of osmic acid which has no effect on the vacuome of normal cells.

WILTSHIRE (S. P.). **The correlation of weather conditions with outbreaks of Potato blight.**—*Quart. Journ. Roy. Meteorol. Soc.*, lvii, 240, pp. 304–316, 1931.

After a brief survey of the work of Dutch investigators on the correlation between weather conditions and outbreaks of potato blight (*Phytophthora infestans*), resulting in the organization of a spray-warning service [see above, p. 96], the author discusses the applicability of the data obtained in Holland to English conditions.

An examination of 26 outbreaks of late blight in England and Wales in the light of tabulated data supplied by the Meteorological Office showed that van Everdingen's four conditions [ibid., v, p. 627] were completely fulfilled during the preceding fortnight in 18 cases. In one case they were almost entirely fulfilled during

the preceding fortnight and completely within the preceding 23 days, while in the remaining seven the requirements were almost exactly satisfied during the preceding fortnight. With one exception, the outbreaks before which the conditions were almost, but not quite, fulfilled show protracted dew formation (7 to 17 hours), this being probably the most important factor, from the phytopathological standpoint, among those measured. It would appear from these results that van Everdingen's four conditions prevail more or less exactly in the great majority of English cases. It was necessary, however, to determine the frequency of such conditions without the resultant development of potato blight. For this purpose an analysis was made of the weather records from 15th April to within 16 days of the outbreak for eight outbreaks following completely favourable days.

The outcome of this examination indicates that in England a number of favourable days occur which are not followed within 15 days by blight epidemics, though the latter often take place within 30 days, and further, that a few favourable days occur irregularly even earlier. In van Everdingen's data a few exactly or almost exactly favourable days were not followed by outbreaks of blight within a fortnight. If no deviation from the Dutch requirements be permitted, then only 18 out of 26 British records completely satisfy the conditions, as compared with van Everdingen's 29 out of 30. Allowing 10 per cent. deviation in one factor alone, all the British outbreaks except three are preceded by almost favourable days within the fortnight before an outbreak, but at the same time the number of the almost favourable days not followed by blight outbreaks is greatly increased.

Attention is drawn to the necessity of close phenological studies for the further elucidation of the potato blight problem. In the writer's opinion, research in this subject is more likely to be promoted by an intensive study of the fungus under field conditions than by an exhaustive statistical examination of the relation of outbreaks to weather records.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Late-blight of Tomatoes and Potatoes.**—*Texas Agric. Exper. Stat. Circ.* 60, 4 figs., 1 map, 1931.

A popular account is given of the symptoms of late blight (*Phytophthora infestans*) on potatoes and tomatoes [*R.A.M.*, vi, p. 583], with notes on the damage caused by an epidemic of the fungus in south Texas in 1931. In Cameron County the final loss in the potato crop was estimated at 30 per cent., while the reduction from late blight in tomatoes ranged from 50 to 100 per cent., with an average of at least 50 per cent. The epidemic is believed to have originated in seed or table potatoes brought into the Rio Grande Valley from northern States. It was experimentally shown that apparently sound tomato fruits from infested fields may already be infected and may develop blight after packing and shipping [ibid., xi, p. 78]. It was found possible to eliminate two-thirds or more of this delayed decay by culling four days after packing.

The Texas epidemic occurred in the early spring, instead of in

the late autumn, as is usual in more northerly regions. During February the weather conditions were almost ideal for the development of the fungus, the average temperature being only 63·7° F., while rain fell on seven days and only three days were free from cloud [see preceding abstract]. The temperature continued low during March. In April, when the tomato crops were attacked, conditions again favoured the spread of *P. infestans*, the average temperature being only 67·6°, with rain on nine days, more or less cloud on 24 days, and heavy dews every night.

Good control of the blight was obtained by the use of copper-lime dust (20 lb. powdered copper sulphate, 10 lb. calcium arsenate, and 70 lb. hydrated lime), at the rate of 20 to 40 lb. per acre. Spraying with 4–4–50 Bordeaux mixture, however, is recommended as more generally effective than dusting.

WAGER (V. A.). **Early blight of Potatoes.**—*Farming in South Africa*, vi, 64, pp. 147–148, 3 figs., 1931.

Popular notes are given on the occurrence of early blight of potatoes (*Macrosporium* [*Alternaria*] *solani*) in South Africa and its control by spraying with Bordeaux mixture 4–4–50. Five applications of the fungicide have been found to give as good results as eight, the yield being increased by 8 to 50 per cent. Satisfactory control of *A. solani* has also been obtained by dusting with Bordeaux or copper-lime dust, of which 4 to 5 lb. per acre should be used with the American Beauty duster. The cost of this treatment at 10 lb. per acre, which allows for wastage, is estimated at about £1 5*s.* 0*d.*

WAGER (V. A.). **The Rhizoctonia disease of Potatoes.**—*Farming in South Africa*, vi, 63, pp. 97–98, 1 fig., 1931.

Heavy damage is caused in all parts of South Africa by *Rhizoctonia solani* (*Corticium vagum*) [*C. solani*], not only on potatoes but also on more than 75 other species of plants. Carnations, for instance, suffer very severely from the attacks of this fungus, which causes the wilting and death of the plants and rotting of the stem base. In recent experiments with two strains of *C. solani* the writer found that neither grew at 95° F. and only one at 41°, the optimum temperature for the development of one of the strains being 86° and for the other 77°. Popular notes are given on the symptoms of the disease and its control.

DASTUR (J. F.). **Potato storage in the Central Provinces.**—*Agric. & Live-stock in India*, i, 4, pp. 374–381, 2 pl., 1931.

During the seven or eight months elapsing between the time when potato tubers in the northern districts of the Central Provinces are placed in storage to provide seed for the 'rabi' (winter) crop and their removal for planting, two entirely different sets of climatic conditions, hot weather and monsoon, have to be considered in relation to storage methods. Soon after harvesting in February or March, the day temperature begins to rise until a maximum of above 100° F. (115° in some parts) is reached, while at the same time there is a marked drop in the atmospheric humidity. During

the summer months, therefore, potatoes must be protected against the effects of excessively high temperatures and low atmospheric humidity; at the onset of the monsoon, however, it is necessary to counteract the influence of high humidity, the temperature becoming more moderate.

The chief cause of the heavy loss among potato tubers in the hot summer months is 'heat rot' or 'black heart' [*R.A.M.*, v, p. 626]. Affected tubers show a black discoloration of the heart due to local changes caused by the death of certain cells; this may spread until the whole tuber is involved. The affected parts are reduced to a pulp and the tuber emits an offensive odour, while drops of a dirty-coloured fluid are exuded from the skin, especially from the 'eyes'.

The chief cause of loss during the high humidity season of the monsoon is the premature sprouting of the tubers.

Other diseases causing severe damage to stored tubers are wet and dry rots (*Fusarium* sp., *Rhizoctonia bataticola* [*Macrophomina phaseoli*: ibid., x, p. 437], and bacteria).

Full details are given of a method of storing potatoes during the hot weather in pits, 24 to 30 inches deep, lined and covered with dry leaves and ventilated by hollow bamboo stems, surrounded by a trench, 6 inches deep by 4 inches wide, which has given satisfactory results during the last four or five years. When kept in ordinary rooms, even if on racks or covered with sand, the losses have been extremely heavy. Pit storage in the areas of heavy monsoon rains is only suitable for seed intended for sowing the monsoon crop. For the winter crop the best results have been obtained by pit storage in dry areas. No benefit was derived from the treatment of the tubers with formalin, mercuric chloride, or uspulun, careful selection being sufficient to ensure good keeping properties.

MURRAY (R. K. S.). **Further sulphur dusting experiments against Oidium.**—*Trop. Agriculturist,* lxxvii, 2, pp. 112–119, 2 pl., 1931.

The author states that sulphur dusting experiments [some details of which are given] in 1930–1 on the same fields of the Kandanuwara Estate, Ceylon, as in 1929–30 [*R.A.M.*, ix, p. 804] for the control of rubber mildew (*Oidium*) [*heveae*] fully confirmed the conclusions previously formed as to the efficacy of the treatment [cf. also ibid., x, p. 486]. The measure of control attained in that season was even greater than in previous experiments, it is believed mainly because the operations were started earlier, a fact which emphasizes the necessity of keeping a careful watch for the first sign of mildew activity, when the first dusting should be immediately made. A computation of the expense involved in the treatment indicates that, even disregarding the increase in yield of rubber, the sulphur dusting can be safely recommended in severely infected areas for the sake of improving the general health of the trees, as no manurial or other treatment has ever effected so marked an improvement as that brought about by the dusting during two consecutive seasons. The control field, on the other hand, is in a very poor condition; the bark renewal in it is almost

negligible, the yield shows a considerable decrease, and the trees appear to be doomed to a more or less early death.

BRANDENBURG (E.). **Die sogen. Urbarmachungskrankheit bei Futterrüben und Erbsen.** [The so-called reclamation disease of fodder Beets and Peas.]—*Angew. Bot.*, xiii, 5, pp. 456–459, 1931.

The results of the writer's recent investigations in Holland on the part played by a species of *Pythium* in the reclamation disease of fodder beets and field peas (*Pisum arvense*), and by *Aphanomyces* sp. in the reclamation disease of oats [*R.A.M.*, x, p. 487], are here recapitulated in a condensed form.

SALMON (E. S.) & WARE (W. M.). **An unusual form of Hop canker.** —*Journ. South-Eastern Agric. Coll., Wye, Kent,* xxviii, pp. 62–64, 1 fig., 1 diag., 1931.

An account is given of an unusual form of hop canker (associated with a species of *Fusarium* having apparently a *Gibberella* as its perfect stage) [*R.A.M.*, ii, p. 132; iv, p. 264; ix, p. 339] which was reported from near Canterbury in 1924. The cankers, bearing *Fusarium* pustules, were usually about 2 in. above the soil, and not, as is usual, at the junction of the bine and crown. The attack had started in one corner of the garden (which consisted of the Fuggles variety) and had spread inwards probably from a large stack of strap cuts which bore *Fusarium* and *Gibberella* on their surface.

Further cases were found in a garden near Faversham in 1930 on six-year-old Fuggles hops which had suddenly wilted just before the hops were ready to be picked. The hills had been earthed up and the canker though sometimes entirely above ground was commonly just below the level of the soil and extending upwards to as much as a foot above the crown. *Fusarium* was present in abundance. These bine cankers are thought to have been favoured by the moisture induced by continuous rain in the earth heaped up around the hills.

SHEPHERD (E. F. S.). **Diseases of Sugar Cane in Mauritius.**—*Mauritius Dept. of Agric. Bull.* 41, Gen. Ser., 27 pp., 15 figs., 1931.

In continuation of his previous bulletin on the subject [*R.A.M.*, v, p. 695], the author gives full notes in popular terms, illustrated by numerous figures, on the symptoms and control of the following diseases of sugar-cane in Mauritius: red rot (*Colletotrichum falcatum*), smut (*Ustilago scitaminea*), gummosis (*Bacterium vascularum*), leaf scald (*Bact. albilineans*), root disease, pineapple disease (*Ceratostomella paradoxa*), top rot, the leaf spots caused by *Leptosphaeria sacchari*, *Helminthosporium ocellum*, and *Cercospora longipes*, streak, and stem deterioration. Most of the information given has already been noticed from other sources [ibid., ix, pp. 340, 507; x, p. 503, *et passim*]. A bibliography of 38 titles is appended.

Cook (M. T.). **Enfermedades de la Caña de Azucar en Puerto Rico.** [Diseases of Sugar-Cane in Porto Rico.]—*Puerto Rico Dept. Agric. y Com., Estac. Exper. Insul. Circ.* 94, 45 pp., 17 figs., 1931.

In this paper (translated into Spanish by F. Chardon) the writer gives popular notes on a number of well-known sugar-cane diseases occurring in Porto Rico [*R.A.M.*, ix, p. 808], much of the information on which has already been noticed from other sources. A key for the identification of the diseases is appended.

Fawcett (G. L.). **Las plantaciones de Caña sin mosaico en Tucumán.** [Cane plantations without mosaic in Tucumán.]—*Rev. Indust. y Agric. de Tucumán*, xxi, 7–8, pp. 126–127, 1931.

Notwithstanding stringent precautions in the matter of roguing and isolation, it has so far been found almost impossible to establish mosaic-free sugar-cane plots in Tucumán, Argentina [*R.A.M.*, viii, p. 636]. One plantation of P.O.J. 213 cane at the Experiment Station has remained healthy, possibly because it is overshadowed by avocado (*Persea gratissima*) trees and therefore avoided by aphids. Under such conditions, however, the canes naturally do not attain their full development, so that the establishment of plantings in similar sites holds little prospect of practical utility.

Bouriquet (G.). **Un pourridié de la Canne à sucre causé par Dictyophora multicolor Berk et Br.** [A root rot of Sugar-Cane caused by *Dictyophora multicolor* Berk. et Br.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 6, pp. 220–224, 1 pl., 1931.

The fructifications of *Dictyophora multicolor*, a member of the Phallaceae, were found in contact with the collar of stunted and rachitic sugar-canes growing in excessively wet soil in localities on the east coast of Madagascar. That the fungus was parasitic was indicated not only by the unhealthy condition of the canes and their roots, but also by the fact that mycelial strands from the carpophores were found to be adhering to the roots, within which was a fine mycelium resembling these strands. Louvier canes were the most susceptible, while the Port Mackay and Batavia varieties showed a satisfactory degree of resistance.

Control methods should consist in improved cultural methods and the use of resistant varieties.

Hiratsuka (N.). **Bibliography of Uredinales in Japan (1858–1930).**—*Fungi (Nippon Fungological Soc.)*, i, 1, pp. 2–13, 1931.

This paper contains 162 bibliographical references to the literature of the Uredinales of Japan, covering the period from 1858 to 1912, inclusive.

Jackson (H. S.). **The rusts of South America based on the Holway collections. IV.**—*Mycologia*, xxiii, 5, pp. 332–364, 6 figs., 1931.

In this, the fourth paper of this series [*R.A.M.*, x, p. 756], the author describes 67 rusts (including two new genera and 19 new species) occurring on representatives of several sections of the

Leguminosae, and on Geraniaceae, Oxalidaceae, Erythroxylaceae, Malpighiaceae, and Rutaceae.

Sydow (H.) & Petrak (F.). **Micromycetes philippinenses. Series secunda.** [Philippine Micromycetes. Second series.]—*Ann. Mycol.*, xxix, 3–4, pp. 145–279, 1931.

Continuing their critical and taxonomic study of Philippine fungi [*R.A.M.*, viii, p. 137], the authors enumerate over 250 species of which more than 90 are new, with nine new genera. Latin and German diagnoses are furnished and there are numerous annotations.

Sideris (C. P.). **Taxonomic studies in the family Pythiaceae. I. Nematosporangium.**—*Mycologia*, xxiii, 4, pp. 252–295, 12 figs., 1931.

In this paper, which is stated to be the first of a series of taxonomic studies on the members of the family Pythiaceae, the author discusses the reasons which led him to re-establish the genus *Nematosporangium* [*R.A.M.*, ix, p. 561; x, p. 740; see also x, p. 342]. This is followed by detailed morphological and cultural descriptions of the twelve species (including three varieties) established by him in this genus, some of which have already been mentioned in a previous communication [ibid., x, p. 555], and all of which, with the exception of *N. indigoferae*, received from McRae in India, are stated to be more or less aggressively parasitic on the hosts enumerated in that publication [*Pennisetum barbinodum*, included among the hosts in the previous paper, is referred to under the name *Panicum barbinode* [*P. molle*] in the present one]. These species are *N. arrhenomanes*, *N. spaniogamon* n. sp., *N. hyphalosticton* n. sp., *N. polyandron* n. sp., *N. thysanohyphalon* n. sp., *N. rhizophthoron* n. sp., *N. leucosticton* n. sp., *N. leiohyphon* n. sp., *N. epiphanosporon* n. sp., *N. aphanidermatum*, *N. butleri*, and *N. indigoferae*. With the exception of the two last-named species, all these organisms were isolated from pineapple root rots. A key for the identification of these species is given.

Solheim (W. G.) & Stevens (F. L.). **Cercospora studies. II. Some tropical Cercosporae.**—*Mycologia*, xxiii, 5, pp. 365–405, 12 figs., 1931.

In this paper [which is in continuation of Solheim's previous communication: *R.A.M.*, x, p. 59] brief accounts are given (together with taxonomic notes and critical observations) of some 50 species of *Cercospora*. This genus is now divided into 38 sections, one of which is transferred to the genus *Didymaria* Corda, and for the last one of which the new genus *Ragnhildiana* is created to include the forms intermediate between *Cercospora* and *Cladosporium*. A key to the different sections is appended. The following may be mentioned.

Cercospora raciborskii Sacc. and Syd. [ibid., i, p. 207] on leaves of tobacco was examined from Hawaiian material, and is considered to be distinct from, though very closely related to, *C. nicotianae* [ibid., x, pp. 561, 585]. *C. manihotis*, *C. cearae*, and *C. henningsii*

are thought from the brief descriptions to be probably the same as *C. cassavae* [ibid., v, p. 144], but three specimens formerly determined as *C. henningsii* and one as *C. cassavae* from Porto Rico were found to belong to the new genus *Ragnhildiana* and are included in the new species *R. manihotis*. A form causing long, fairly broad, yellow to tan spots on the leaves of *Hibiscus esculentus* in the Philippines is considered to be a new species and is named *C. malayensis*. *C. cruenta* (with which *C. dolichi* may perhaps be identical) was determined from leaves, stems, and pods of *Phaseolus* sp., *P. vulgaris*, *P. lunatus*, *P. mungo*, *Dolichos* sp., and *Vigna catjang*; and *C. canescens* from leaves of *Phaseolus* sp., *P. lunatus*, *P. vulgaris*, *V. catjang*, *V. glabra*, *Amaranthus* sp., *Ricinus communis*, and from dead stems of tomatoes and *Petunia parviflora*.

Berkeley (G. H.), Madden (G. O.), & Willison (R. S.). **Verticillium wilts in Ontario.**—*Scient. Agric.*, xi, 11, pp. 739–759, 10 figs., 1931.

In this paper the authors discuss in detail the taxonomic position of the species of *Verticillium* implicated in hadromycosis, and give in full their reasons for not accepting Wollenweber's [*R.A.M.*, ix, p. 6] and Rudolph's [ibid., x, p. 757] views in this respect. They start by pointing out that in this section of the genus *Verticillium* there are two types of resting condition. One of these, characteristic of *V. albo-atrum*, consists of loose masses of dark, thick-walled hyphae with numerous transverse septa, but no longitudinal walls, the individual cells of which are torulose, or may be little differentiated from the rest of the mycelium. The other type is composed of dark, knot-like, thick-walled structures, the result of budding of a single hypha, and is typical of *V. dahliae*. In their opinion, Wollenweber's and Rudolph's interpretation of *V. albo-atrum* as a sclerotial fungus is not correct, and is based on the loose usage of the term 'sclerotia' in the original description by Reinke and Berthold of the above-described loose masses of hyphae, for which they prefer the designation 'resting mycelia' (Dauernmycelien) also used by the original authors. Neither can the formations of the second type be correctly designated as sclerotia, since they do not consist of a weft of intertwining hyphae and have no cortical tissue differentiated from the rest of the structure; the term 'pseudo-sclerotia' is suggested for them. The study during seven years of hundreds of isolations of forms of *Verticillium* from many different hosts in Ontario, and also of type cultures of *V. albo-atrum* and *V. dahliae* obtained from the Centraalbureau voor Schimmelcultures in Baarn, showed that these characters of the two groups are very constant, sometimes disappearing after prolonged culture on synthetic media but reappearing when transferred to sterilized potato plugs, and are sufficient by themselves to differentiate *V. dahliae* from *V. albo-atrum*. In no case was the formation of true sclerotia or microsclerotia observed in any of the cultures of either species maintained by the authors. Another feature distinguishing the two species is their difference in pathogenicity as indicated by cross-inoculation studies with thirty-seven strains on thirteen different hosts during six

years; besides other minor differences, it was shown that the members of the resting mycelium (*V. albo-atrum*) group are stronger parasites than those of the pseudo-sclerotial (*V. dahliae*) group.

TAI (F. L.). **Observations on the development of Myriangium bambusae Rick.**—*Sinensia* (*Contr. Metrop. Mus. Nat. Hist. Acad. Sinica*), i, 10, pp. 147–164, 22 figs., 1931.

An account is given of the writer's studies of the morphology and cultural characters of *Myriangium bambusae*, a common parasite of the cultivated bamboo (*Phyllostachys puberula*) [*P. nigra*] round Nanking, China. The asci, one of which occurs in each locule of the stroma, are double-walled, subglobose to oblong, stipitate, 35·70 to 49·35 by 34·00 to 44·65 μ, and contain eight yellowish, muriform, fusiform, slightly curved, 5- to 7-septate ascospores, 32·90 to 44·00 by 14·10 to 16·45 μ. The inner sheath expands after ten minutes' to one hour's immersion in water, elongating to three or five times its original diameter after the rupture of the outer wall. The protruding ascus, elliptical at first, ultimately assumes a cylindrical shape. The ascospores germinate (sometimes while still within the ascus) either by the production of sprout cells or by the formation of a germ-tube direct from each cell. The sprout cells may fall off and germinate by germ-tubes, from which secondary sprout cells may again be budded off laterally or apically.

Small pycnidia, 45·6 to 60·8 μ in diameter, with a beak averaging 18 μ in height, and containing rod-shaped pycnospores, were observed either on the upper surface of the stroma or on the remaining host tissue at the margin of the stroma, but were not proved to be part of the life-cycle of *M. bambusae*. One of the cultures isolated from the ascigerous stage formed elliptical to cylindrical conidia, 9·16 to 19·17 by 2·5 to 3·75 μ, which developed singly on the tips of conidiophores.

STEINMANN (A.). **Verslag van den Mycoloog over 1930.** [Report of the Mycologist for 1930.]—*Arch. voor Theecult. Nederl.-Indië, 1931,* 4, pp. 161–164, 1931.

Experiments are in progress in Java on the control of the red root fungus of tea [*Ganoderma pseudoferreum*: *R.A.M.*, x, p. 409] by the application to the soil of copper sulphate, hedit, sulphur, sodium chlorate, and other inexpensive chemical disinfectants. The results of tests (now concluded) on the Pengalengan plateau showed that the hydrogen-ion concentration of the soil can be reduced within six months from P_H 5·8 to about 3 by sulphur applications at the rate of 500 gm. per sq. m. of soil. White zinc paint was found to be a good protective covering for pruning wounds on tea bushes.

Cinchona grafts are liable to a stripe disease characterized by the presence of coloured hyphae in the wood but not in the bark, so placed that the fungus (believed to be a species of *Diplodia*) evidently enters through the grafting wound at the stem base and thence proceeds upwards.

Haskell (R. J.), McMurtrey (J. E.), & Fant (G. W.). **Results of the Tobacco survey, 1930.**—*Plant Disease Reporter, Supplement* 80, pp. 5–29, 1931. [Mimeographed.]

As an outcome of the Conference on Tobacco Diseases and Nutritional Problems held at Washington, D.C., from 10th to 12th December, 1929, arrangements were made by the Plant Disease Survey and the Division of Tobacco and Plant Nutrition of the Bureau of Plant Industry with State collaborators and plant pathologists for seed-bed and field surveys in the tobacco-growing sections. A full account, accompanied by tables, is given of this work, comprising notes on the incidence of the various diseases observed, seed treatment, weather conditions, spraying, crop rotation, and the like.

Henderson (R. G.) & Wingard (S. A.). **Further studies on Tobacco ring spot in Virginia.**—*Journ. Agric. Res.*, xliii, 3, pp. 191–207, 7 pl., 1931.

After a brief discussion of the distribution and economic importance of the ring spot disease of tobacco, the authors give a summary account of laboratory and greenhouse experiments in Virginia [some of which have already been noticed: *R.A.M.*, x, p. 492] to determine some of the properties of the virus causing it. The virus is very sensitive to desiccation, since in no case could infection be obtained from dried tobacco leaves. Three minutes' exposure to a temperature of 70° C. entirely inactivated the virus, while ten minutes at 60° considerably reduced its virulence. Juice expressed from infected tobacco plants and stored at −18° C. retained its infective power unimpaired for over 22 months. The virus is readily precipitated and separated from expressed juice with alcohol or acetone, and is filterable through a Berkefeld filter of W grade if the infectious juice is first freed from solid matter. It is infectious at dilutions as high as 1 in 1,000, but only a trace of infection could be obtained with a 1 in 10,000 dilution. Under greenhouse conditions the virus was found to persist for more than a year in the sap of tobacco plants propagated by cuttings, although the ring spot symptoms may remain masked in the plants during the whole of this period. Typical symptoms developed on detached tobacco leaves and cuttings which were kept alive in the laboratory in moist chambers, and it was shown that tobacco leaves of intermediate age and size are more susceptible to ring spot infection than either the very young or the very old leaves. Artificial inoculation of certain varieties of potato with the virus resulted in local infection (mostly solid necrotic spots) on the leaves; and re-inoculations on tobacco produced typical ring spots, but later some of the symptoms described by Johnson [ibid., v, p. 119] also began to develop, the indications being that the 'healthy potato virus' was also present. In tomato plants infection was produced by grafting them on diseased tobacco plants.

The investigation also showed that Jimson weed (*Datura stramonium*) and melon (*Cucumis melo*) are natural hosts of the tobacco ring spot virus. The viruses naturally present in *Melilotus officinalis*, yellow ironweed (*Verbesina* [*Actinomeris*] *alternifolia*), squash (*Cucurbita pepo* var. *condensa*), and *Petunia violacea* pro-

duced lesions very like ring spot when transferred to tobacco, differing in the severity of the symptoms produced on the latter; it is suggested that they may possibly be attenuated forms of the tobacco ring spot virus. There was very little evidence that this virus is seed-borne in tobacco, but it was very readily transmitted through the seed from naturally infected *Petunia violacea* plants [ibid., x, p. 492].

FENNE (S. B.). **Field studies on the ring-spot disease of Burley Tobacco in Washington County, Virginia.**—*Phytopath.*, xxi, 9, pp. 891–899, 1931.

The steam sterilization of tobacco plant beds in Virginia failed to prevent the occurrence of ring spot [see preceding abstract] infection in fields planted from these beds. In 1927 the percentage of infection by this disease in ten counties in Virginia amounted to 2·5 per cent. In Washington County 3 per cent. ring spot infection was recorded in 1928 and 7·6 per cent. in 1929, with an average injury of 43 per cent. to the affected plants, mainly by reduction in size of the leaves. The total loss caused by ring spot in Washington County during 1929 is estimated at $27,384.

Negative results were obtained in all attempts to transmit the ring spot virus by means of tobacco flea-beetles (*Epitrix parvula*), cucumber flea-beetles (*E. cucumeris*), leafhoppers (*Empoasca fabae*), aphids (*Macrosiphum solanifolii*) [*M. gei*], tobacco worms (*Phlegethontius quinquemaculata*), and fireflies (*Photinus scintillans*). Still the method of spread suggests that there must be an insect vector [cf. ibid., x, p. 695]. Stick weed (*Verbesina* [*Actinomeris*] *alternifolia*) and sweet clover (*Melilotus alba*) were found naturally infected by ring spot. Infection was readily produced on tobacco with the expressed juice from these plants. Twenty-five other species of weeds were tested for ring spot with negative results.

MURWIN (H. F.). **Dominion Experimental Station, Harrow, Ontario. Report of the Superintendent for the years 1928, 1929 and 1930.**—90 pp., 9 figs., 1931.

This report contains (pp. 46–47) a note in which the results of experiments in varietal resistance to black root rot of tobacco (*Thielavia basicola*) at Harrow, Ontario, are presented in tabular form [*R.A.M.*, vii, p. 348; x, p. 761]. It was found that the standard flue-cured varieties, Warne and Hickory Pryor, are more resistant to the disease than the non-resistant varieties of either Burley or dark tobacco. Most resistant of all, however, are the resistant Burley varieties, Stand-up and Broad-leaf Resistant and C.R.B., and the dark G.R. Nos. 11009, 11008, and 11001.

WOLF (F. A.). **Gray mold of Tobacco.**—*Journ. Agric. Res.*, xliii, 2, pp. 165–175, 5 figs., 1931.

A brief account is given of a seedling disease of tobacco in North Carolina, caused by a species of *Botrytis* which is tentatively referred to *B. cinerea*. The disease, which appears as a grey mould of the leaves, later passing on to the stems which are girdled and finally killed [cf. *R.A.M.*, x, p. 628], is stated to be very prevalent in tobacco seed-beds in wet seasons, as it is apparently correlated

with high atmospheric humidity; thus, in 1928 and 1929 it was observed in nearly all of approximately 250 seed-beds examined, in a few of which it was so abundant and so destructive that none of the plants could be transplanted, while in 1930, the spring of which was much drier, only two out of 257 seed-beds investigated showed its presence. It is thought probable that the same organism may be associated with 'stem rot' of tobacco in curing sheds in Connecticut, Virginia, and Kentucky.

It was noted that the disease was most destructive in seed-beds situated on low-lying, poorly drained, and poorly ventilated ground, and it is believed that much of the damage done by it may be prevented by a proper choice of a site for the tobacco seed-beds.

JOCHEMS (S. C. J.). **Spikkel in Deli-Tabak.** [Leaf spot of Deli Tobacco.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. 2, lxxii, 38 pp., 3 pl., 1931. [English summary.]

Leaf spot (frog-eye) of tobacco (*Cercospora nicotianae*), which was very prevalent in Sumatra during the early period of tobacco cultivation (until 1900), was practically absent from 1910 to 1929, but in 1930 it recurred in a severe form, especially in black alluvial soils, and again caused considerable damage in 1931 [*R.A.M.*, vi, p. 444; x, p. 561].

The spots formed by the fungus on both surfaces of the green leaves in the field are circular, white or light brown, 1 to 10 mm. in diameter, with a darker brown edge, $\frac{1}{4}$ to 1 mm. wide, and an ashen-grey centre, the last-named being a distinguishing feature of infection by *C. nicotianae*. In some cases incipient infections continued to develop after the leaves had been picked [ibid., ix, p. 141], causing damage in the curing barns. In this form the lesions on the upper side of the dried leaves range from a dirty bluish-green to nearly black; on the under side they are always pale bluish-grey. These spots are circular and measure 2 to 10 mm. in diameter; they are much less sharply delimited than those on the green leaves and also less brittle. The centre of the lesions is usually occupied by a paler blue spot, 1 to 2 mm. in diameter, and on thick, reddish leaves a yellowish-brown margin may be observed round the lesions. It was shown by experiments [details of which are given] that the spots on cured tobacco leaves, especially of superior quality, largely disappear or become paler during fermentation. Rapid drying was found to prevent the development of these lesions to some extent.

Considerable importance is attached to the control of this barn spot, since the disease not only detracts from the appearance of the wrapping material but also impairs the elasticity of the leaves.

HOPKINS (J. C.). **Southern Rhodesia: Alternaria leaf spot of Tobacco.**—*Internat. Bull. of Plant Protect.*, v, 9, p. 165, 1931.

During the past season a serious leaf spot of tobacco occurred in several districts of Southern Rhodesia. The chief symptom of the disease, of which there are only two previous local records, is the appearance of small, brown spots on the lower leaves when the plants are coming into flower. The spots are chestnut- or Vandyck-brown with light brown or white centres and closely resemble those of

frog-eye (*Cercospora nicotianae*) [see preceding abstract]. Zonations are sometimes present in the darker brown parts of the lesions, which may enlarge to a diameter of 2 cm. Dark spots on the stem and midrib and the rapid spread of the disease to the uppermost leaves and seed pods are characteristic of infection by the *Alternaria* responsible for the spotting, which has been referred to *A. tabacina* (Ell. & Ev.) Hori, but does not appear to be identical with *Macrosporium tabacinum* Ell. & Ev. associated with white speck of tobacco. It is thought to be probably the same as the organism causing a similar leaf spot in Hungary, referred by Gulyás to *A. tabacina* [*R.A.M.*, x, p. 212]. The quality of the affected leaves appears to undergo considerable deterioration during the curing process. The Hickory Pryor variety suffers severely from this *Alternaria* leaf spot, to which Orinoco White Stem, Gold Leaf, Warne, and a Turkish variety are also susceptible. The disease is favoured by protracted heavy rain, followed by bright periods, inducing rapid growth of the plants.

JOHNSON (J.) & OGDEN (W. B.). **The relation of air conditions to Tobacco curing.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 110, 6 pl., 1 diag., 13 graphs, 1931.

'Pole rot', which is believed to be identical with the condition described by Sturgis as 'pole burn' in 1891 (*Connecticut Agric. Exper. Stat. Rept.*, p. 168), is stated to have been the cause of difficulties in curing tobacco for a hundred years or more. In the writers' experiments the typical symptoms of pole rot were induced by the exposure of the leaves to a temperature of 60° F. combined with a constant relative humidity of 95 to 98 per cent. for a few days at the critical stage of curing, i.e., when the leaf-web was turning from yellow to brown. In order to prevent the development of saprophytes on the leaves, these were exposed in an air-tight chamber, while still green, to ceresan dust applied by a small blower for 10 to 15 minutes. The treated leaves cured normally, with a fairly good colour and little or no decay, whereas the undusted ones were severely damaged by typical pole rot. It seemed evident, therefore, that the disease was due to certain organisms and not of a purely physiological nature.

Both in the curing shed and under experimental conditions the first symptoms of pole rot are the development of small, round spots appearing comparatively dark by reflected, but translucent by transmitted light. The predominant fungus in these lesions has been identified as *Alternaria tenuis* [*R.A.M.*, vii, p. 765], the optimum temperature for the development of which probably lies near 80°. Experimentally the writers produced pole rot at a temperature range of 60° to 95°, with an evaporating power of 8 c.c. or less per diem.

It would appear that the only reliable method of prevention of shed damage during protracted periods of damp weather is the reduction of excessive humidity by the provision of artificial heat, in the form, for instance, of a small, open charcoal fire such as is used on primed, shade-grown tobacco in the Connecticut Valley with satisfactory results. Much more complete tests are, however, considered to be essential to the ultimate solution of the problem.

Jørstad (I.). **Innberetning fra statsmykolog Ivar Jørstad om soppsykdommer på skogtraerne i årene 1926–1930.** [Report from the State Mycologist Ivar Jørstad on the fungous diseases of forest trees during the years 1926–1930.]—*Beretning om det Norske Skogwesen for 1930*, Skogdirektøren, Oslo, pp. 78–96, 1931.

Notes are given on the diseases of forest trees observed in Norway between 1926 and 1930 [cf. *R.A.M.*, vi, p. 201]. Owing to the ravages of blister rust (*Cronartium ribicola*), Weymouth pines [*Pinus strobus*] are gradually disappearing, and in some districts they are being eradicated in order to safeguard the neighbouring black currants.

P. sylvestris, *P. murrayana*, and Austrian pine [*P. laricio* [var.] *austriaca*] are liable to heavy damage from the cankers produced by *Dasyscypha subtilissima*, *D. resinaria*, and *D. fuscosanguinea*, the last-named being primarily a northern species [ibid., viii, pp. 424, 687, 744].

Brunchorstia pinea, the perfect stage of which has recently been referred by Jørgensen in Denmark to *Crumenula abietina* [ibid., x, p. 272], causes severe injury to Austrian pine, *P. montana*, and *P. cembra* in the western coastal and adjacent districts. *C. pinicola* sometimes accompanies *B. pinea*, but is more often found alone as a parasite on the young branches of *P. sylvestris* and other pines. In the spring of 1927 some half million *P. sylvestris* and *P. montana* nursery trees were destroyed by *Lophodermium pinastri*. *Phacidium infestans* [ibid., x, p. 1] is the cause of extremely severe injury to *P. sylvestris* and other pines in the higher altitudes, where the fungus develops under the snow cover. *Picea pungens* is highly susceptible to infection by *Rhizosphaera kalkhoffii* [ibid., viii, p. 275], which is widely distributed in spruce stands throughout the country, often causing considerable leaf fall.

D. calyciformis [ibid., viii, p. 424] has been observed on *Abies balsamea*, *A. cephalonica*, *A. concolor*, *A. fraseri*, *A. grandis*, *A. nobilis*, *A. nordmanniana*, *A. pectinata*, and *A. sibirica*, while *A. pinsapo* appears to be immune. *Rehmiellopsis abietis* [ibid., v, p. 197] attacks the current year's spruce shoots (especially *A. pectinata*) to which it gives a frost-bitten appearance; *A. sibirica* has also been found susceptible. *Pseudotsuga taxifolia* was infected by *D. resinaria* in 1927 and 1928. *Diaporthe aristata* is a common parasite of birch branches. *Venturia tremulae*, the conidial stage of which is *Fusicladium radiosum*, produces black spots on aspen leaves and often kills the current year's shoots; this fungus is liable to occur in epidemic form. *Marssonina populi* [ibid., ix, p. 568] is responsible for the brown discoloration and shedding of poplar (*Populus nigra*, *P. laurifolia*, and *P. alba*) leaves. Ash cankers due to *Nectria galligena* [ibid., xi, p. 12] are stated to be very prevalent in the coastal districts. *V. fraxini* has occasionally been observed to produce spots on ash leaves.

An examination by Dr. H. W. Wollenweber of elm material suspected of infection by *Graphium ulmi* showed that this fungus was not present; legislative measures to prevent its introduction were adopted in 1930 [ibid., ix, p. 816]. *Uncinula tulasnei* [ibid., x, p. 274] causes considerable damage to Norway maples [*Acer*

platanoides] in nurseries. The same host is extensively affected by the witches' brooms due to *Taphrina acerina*, which spreads so rapidly from branch to branch that the crown of an infected tree soon appears to consist solely of witches' brooms. *Polyporus connatus* causes a wood rot of *A. platanoides*, plane [*Platanus*], poplar, lime, and beech trees.

FINLAYSON (E. H.). **Report of the Director of Forestry 1929–30 (fiscal year ended March 31, 1930).**—*Dept. of the Interior, Canada*, Ottawa, F. A. Acland, 62 pp., 8 figs., 1931.

This report contains, *inter alia*, the following items of phytopathological interest. In the summer of 1928 an investigation was commenced on a nursery disease of poplars, apparently due to a *Septoria*. The shoots of a large number of poplar cuttings in the forest nursery station showed from one to five oval, black, depressed spots, up to 1 inch long and extending to half the circumference of the stem; many shoots showed yellow leaves that later shrivelled but remained attached to the stem. Inoculation experiments on healthy rooted cuttings with the fungus gave positive results.

Counts made in the summer of 1929 indicated that the average survival from clean cuttings is 82 per cent., compared with 33 per cent. when the cuttings showed blackened areas. The selection of clean cuttings and planting in clean soil appear to be sufficient to ensure control of the disease.

A species of *Cytospora* has been found responsible for an injurious perennial stem and branch canker of older poplars [*R.A.M.*, x, p. 418]. On inoculation the fungus appears harmless on healthy tissue, but in callus tissue surrounding wounds in the Russian poplar [? *Populus maximowiczii*] it becomes established, and by repeated annual injury with fresh callus production causes a very common and ultimately fatal lesion. A number of greenhouse inoculations were unsuccessful, indicating that the fungus is a weak parasite which can only penetrate the tissues through wounds. Cottonwood (*P. deltoides*) is occasionally attacked by the perennial canker but appears to be much less susceptible than the Russian poplar.

The question of brown or red heart in yellow birch [*Betula lutea*], the use of which for commercial purposes is stated to be increasing, has been investigated at the request of the Pulp and Paper Association. *Torula ligniperda* [ibid., ix, p. 215] was isolated from brown streaks in the heartwood, and when reinoculated into birch culture-blocks it produced a conspicuous discoloration in the wood.

VOGLINO (P.). **Il 'secume' del Pioppo.** [Die-back of Poplar.]—*La Difesa delle Piante*, viii, 3, pp. 1–3, 1931.

In recent years the die-back due to *Didymosphaeria populina* [the symptoms and mode of transmission of which are briefly described] has become increasingly prevalent on *Populus canadensis* Moench in Piedmont. In 1926 Ferraris stated that the disease was common in various parts of France on *P. nigra* var. *italica* [the Lombardy poplar] though other poplars appeared to

be unaffected; however, as early as 1905 the author had already observed the leaf form of the disease on other species.

In May, 1930, diseased branches of *P. canadensis* were received from all parts of Piedmont where excessive rain and sudden changes of temperature appeared to have provoked a rather violent epidemic of the disease. As the trees were affected while in an early stage of vegetation the only effect of the condition was a temporary arrest of growth.

P. canadensis appears to be highly susceptible, whereas the Carolina poplar (*P. canadensis* var. *carolensis* Foug.) is almost completely resistant, as is a cross between the former and *P. nigra*.

In spite of the severity of the outbreak in 1930, the disease is not considered to constitute a serious danger at present, attacks depending upon an exceptionally wet spring. In 1931, when the spring was normal, no attack of *D. populina* was reported from the localities previously affected.

KÄMPFER (M.). **Neue Seuche an Pappeln.** [A new Poplar epidemic.]—*Gartenwelt*, xxxv, 38, p. 525, 1 fig., 1931.

Some 90 per cent. of the five- to eight-year-old poplar (*Populus simonii*) trees in the Köpenick district of Berlin were severely attacked in the summer of 1931 by *Dothichiza populea* [*R.A.M.*, x, p. 417]. The fungus spreads up and down the trunk from the primary centres of infection in the branch rings, forming discoloured, scabby, moist lesions almost the size of a hand. Sinuous, depressed areas develop as a result of the disorganization of the tissues by the fungus, and in advanced stages of the disease the leaves wilt and die. Presumably the trees in question were weakened by their transplantation during the last three years. *D. populea* has recently been reported with some frequency from Westphalia, into which province it was probably introduced from France on *P. robusta*.

BUISMAN (CHRISTINE). **Übersicht über die Ulmenarten in Bezug auf den Kampf gegen die Ulmenkrankheit.** [Survey of Elm species in connexion with the campaign against the Elm disease.]—*Angew. Bot.*, xiii, 5, pp. 459–464, 1931.

Reference to the writer's notes on the distribution of the different species and varieties of *Ulmus* in America, Asia, and Europe, in connexion with the control of the elm disease (*Graphium ulmi*) by the use of immune or resistant sorts, has already been made from another source [*R.A.M.*, x, p. 696].

FRANSEN (J. J.). **De verbreiding der Iepenziekte door de Iepenspintkevers en de bestrijding van dit insect in de practijk.** [The spread of the Elm disease by Elm sap beetles and the control of this insect in practice.]—*Tijdschr. over Plantenziekten*, xxxvii, 9, pp. 169–183, 3 pl., 1931.

In the course of further investigations [full particulars of which are given] on the direct and indirect control of the elm sap beetles (*Scolytus scolytus* and *S. multistriatus*), which are implicated in the dissemination of *Graphium ulmi* in Holland [*R.A.M.*, x,

p. 565], the writer obtained good results with the following repellents: coal-tar, 100 per cent. carbokrimp (Utrechtsche Asphalt Fabriek) [ibid., v, p. 560], asphalt, 100 per cent. wood carbolineum, and wood carbolineum + paradichlor-benzol. This paper is followed by a discussion (pp. 184–187).

Insect pests and fungus diseases of basket Willows.—*Min. of Agric. & Fish. Bull.* 29, 14 pp., 4 pl., 1931.

Semi-popular notes are given on the following fungous diseases of basket willows (*Salix* spp.): black canker (*Physalospora miyabeana*) [*R.A.M.*, x, p. 139]; rust (*Melampsora* spp.), the cankers caused by which are most frequent on varieties of *S. triandra*, such as Champion and Black Maul; scab (*Fusicladium saliciperdum*) [ibid., ix, p. 500], the occurrence of which in south-west England appears to be secondary to that of black canker; anthracnose (*Marssonina salicicola*) on *S. purpurea* (Red Welsh variety) [ibid., ix, p. 814]; and *Cryptomyces maximus*, reported from Scotland [ibid., vi, p. 65] as causing the development of elongated black cushions on the bark of willow rods and giving them a scorched aspect.

GOODDING (L. N.). **Didymosphaeria oregonensis, a new canker organism on Alder.**—*Phytopath.*, xxi, 9, pp. 913–918, 2 figs., 1931.

Three species of alder, viz., *Alnus rubra, A. tenuifolia*, and *A. sinuata* in the Pacific Northwest are stated to be severely parasitized by a new canker-producing fungus, *Didymosphaeria oregonensis* [*R.A.M.*, x, p. 216]. The cankers, varying from half an inch to 2 ft. or more in length, extend round the young limbs and trunks; they cease to grow when the bark thickens and hardens but scars are often left on the trunks of mature trees. The fungus produces marked zonation on the tender bark so that the age of simple cankers may readily be estimated. A longitudinal section of a canker where swelling has occurred shows increased thickness of the annual layers following infection, apparently due to the release of tension where the outer bark is ruptured when the perithecia reach maturity. Finally, the outer layer of the bark exfoliates, leaving a roughened, ragged surface to which the perithecia usually remain attached, though they may peel off with the outer cork layer.

The perithecia of *D. oregonensis* are globose, dark brown, or black, measuring about 1 mm. across and opening by a very minute pore; the cavity is completely filled with branched, septate paraphyses and cylindrical to clavate or irregular asci, 75 to 90 μ long, containing eight 'kildare green' (Ridgway), uniseptate ascospores, rounded at both ends, measuring 18 to 21 by 7 to 9 μ.

D. oregonensis appears to be related to *D. wallrothii* (Hipp.) Sacc. & Trott. on birch bark (not reported from North America), but it differs from this species in its larger spores, less conspicuous perithecia, and non-protruding ostioles. It may also be allied to *D. nana* var. *brachyspora* Sacc., occurring on alder leaves, but the spores of *D. oregonensis* are relatively broader, and moreover the latter has not been reported on the foliage.

KORSTIAN (C. F.) & BRUSH (W. D.). **Southern White Cedar.**—*U.S. Dept. of Agric. Tech. Bull.* 251, 75 pp., 15 figs., 3 graphs, 1 map, 1931.

This bulletin contains (pp. 13–15) notes on white cedar (*Chamaecyparis thyoides*) diseases in the Atlantic and Gulf coastal swamps and estuaries of Virginia, North Carolina, New Jersey, Alabama, and Florida. *Keithia* [*Didymascella*] *chamaecyparissi* [*R.A.M.*, vii, p. 59] is a vigorous parasite that causes severe damage to the foliage of young trees and seedlings, eventually killing the twigs. The perithecia of the fungus are usually conspicuously reniform; they occur on the upper side of the leaf and rupture unilaterally. The effects produced by *Lophodermium juniperinum* are similar but less destructive. This organism has small, black fruiting bodies which rupture irregularly, and are found chiefly on foliage in very moist conditions. *Asterina cypressina* attacks and kills the leaves of older twigs.

Gymnosporangium myricatum, the alternate stage of which occurs on *Crataegus*, produces warty swellings on the branches and trunks, often accompanied by a broom-like development of twigs. *G. botryapites* causes similar but more fusiform and ridged swellings.

Trametes subrosea [*T. carnea* : ibid., ix, p. 80] is much the most important fungus hitherto found destroying the heartwood of *C. thyoides*. In dense stands there is some evidence of transmission from one tree to another through the roots. The heartwood of the trunk is rarely rotted beyond the first log length, the rot being often confined to definite pockets. In the roots the decay is more uniform. In the early stages it is light reddish-brown, later becoming darker and breaking up into quasi-rectangular blocks that crumble under pressure. The earliest observed infection of southern white cedar by *T. carnea* occurred at the age of 40 to 50 years.

An unidentified laminated, spongy butt rot resembles that caused by *Poria weirii* [ibid., vi, pp. 386, 450] on western red cedar [*Thuja plicata*] and may be due to the same fungus. *Polyporus schweinitzii* has occasionally been observed causing a butt and root rot which is darker, more markedly cubical, more friable, and more evenly distributed through the heartwood than that produced by *T. carnea*. Both *Fomes annosus* and *Armillaria mellea* are parasitic on the roots of *C. thyoides* and cause a white rot of the heartwood, but only one case of each has been studied and the extent of the damage is unknown.

DAY (W. R.). **The relationship between frost damage and Larch canker.**—*Forestry*, v, 1, pp. 41–56, 2 pl., 1 fig., 1 graph, 1931.

The author states that on the ground of his field observations and histological studies [considerable details of which are given] of the cankers of European larch [*Larix europaea*] collected in Bagley Wood near Oxford, he considers that spring and autumn frosts are a definite and often serious cause of canker in this tree. The investigation showed that in young stems, not yet protected by a thick, rough bark, the cambium is susceptible to frost injury from about the middle of March to the beginning of October,

a time which, as indicated by the examination of weather records at Oxford from 1892 to 1929, includes periods during which severe early and late frosts are of common occurrence. In the spring the cambium first becomes active over strictly localized areas, e.g., around a dwarf shoot or at the base of a twig, and it was shown that it is in such areas that canker formation is most liable to occur. The cambium continues to resume activity in the spring in the region of the canker earlier than elsewhere, and apparently also becomes dormant later in the autumn, thus being more liable to frost injury than in other parts of the tree. Although in all the cankers studied, the larch canker fungus (*Dasyscypha calycina*) [*R.A.M.*, viii, p. 745; ix, p. 501] was present in the dead tissues, there was no evidence of its behaving as a parasite, since the primary diagnostic feature of the cankers was the presence in the wood of definite frost rings, free from fungal mycelium, the nature of the abnormal tissues in which pointed to the lesion being of traumatic origin.

It was finally shown that susceptibility to frost injury is not the same for all individual trees, and that it is to a great extent dependent on the locality.

LIESE (J.). **Zur Rhabdoclinekrankheit der Douglasie.** [On the *Rhabdocline* disease of the Douglas Fir.]—*Forstarch.*, vii, 18, pp. 341–346, 4 figs., 1931.

Particulars are given of the author's investigation of the leaf fall disease of Douglas firs (*Pseudotsuga taxifolia*) caused by *Rhabdocline pseudotsugae* near Wittenberg [*R.A.M.*, x, p. 634 and next abstract]. In one area about 1·2 acres in extent the 16-year-old trees had evidently been infected since 1927. The typical symptoms of the disease [which are briefly indicated] were observed chiefly on the blue and grey varieties (vars. *glauca* and *caesia*), but a certain number of the green type (var. *viridis*) were also affected. *Polyporus* [*Fomes*] *annosus* and the honey fungus [*Armillaria mellea*] occurred on the roots of some of the diseased trees, but no correlation could be found between the occurrence of these fungi and that of *R. pseudotsugae*. The second Douglas fir stand of 6·8 acres presented a similar picture to the foregoing, except that the first severe attack on a number of the 15-year-old trees apparently took place in 1930. The damage caused by *R. pseudotsugae* in these stands is stated to be very considerable. Most of the affected trees have lost all the needles of the last three years' shoots, involving a heavy loss of brushwood.

The trees were originally procured as one-year-old seedlings from J. Hein's Söhne, Halstenbek, and the healthy condition of the older needles shows that the fungus was not present at the time of delivery. Since no further consignments of Douglas firs have been imported, the spores of *R. pseudotsugae* must have been conveyed to the Wittenberg district from some other centre of infection, e.g., Gadow (35 km. from the diseased stands), the Dutch frontier, or the former Grand Duchy of Lauenburg.

During the winter of 1931–2 all infected branches must be burnt. The view has been expressed that the leaf fall epidemic should be allowed to continue unchecked in order to eliminate all susceptible

individuals, but this course is opposed by the writer on technical and economic grounds.

Plettenberg v. **Rhabdocline pseudotsugae.**—*Forstwissensch. Centralbl.*, liii, 21, p. 772, 1931.

According to an official statement issued by the local committee for silvicultural seed certification of the Chamber of Agriculture for the Brandenburg and Berlin Province, Douglas firs [*Pseudotsuga taxifolia*] are infected by *Rhabdocline pseudotsugae* in two districts of the Mark Brandenburg, one of Hanover, and one of Holstein [see preceding abstract]. It is recommended by the forestry plant protection headquarters (College of Forestry, Eberswalde) that all diseased trees should be felled during the coming autumn and winter and the lopped wood burnt before the spring.

Snell (W. H.). **The Kelm Mountain blister-rust infestation.**—*Phytopath.*, xxi, 9, pp. 919–921, 1931.

During the past eight summers 96·5 per cent. of the white pine [*Pinus strobus*] trees on the two-acre Kelm Mountain observation plot in Warren County, New York, brought under regular observation by the writer in 1923, have been found to show infection by blister rust (*Cronartium ribicola*) [*R.A.M.*, x, p. 353]. At the time of writing 90·6 per cent. of the stand, most of which is from 17 to 21 years old, showed living cankers, of which 9,000 have been found in all, an average of about 9 per tree. One tree bore 298 cankers and 7 had between 100 and 200. In 1920 there was not a dead tree on the lot; in 1923, 9 per cent. were dead, in 1924, 14 per cent., in 1926, 30 per cent., in 1927, 42 per cent., in 1929, 60 per cent., and in 1930, 69 per cent. There still remain on the plot 18 per cent. of the entire number expected to die in a few years, making an imminent mortality of 87 per cent. of the stand. The original stand, undisturbed by disease, would probably have produced between 60,000 and 70,000 board feet of high-grade lumber. The rust will have left only 147 healthy trees, of which 40 will be removed by shading, and the value of the survivors will be negligible. The 147 trees which withstood the severe attacks of blister rust between 1910 and 1920 and are still intact appear to be genuinely immune from *C. ribicola*, and tests on the reaction of their progeny to the rust would be of great interest.

Koch (E.). **Can the cost of blister rust control be justified?**—*Journ. of Forestry*, xxix, 5, pp. 721–723, 1931.

Some statistics are given in support of the ten-year plan of *Ribes* eradication for the control of white pine blister rust [*Cronartium ribicola*: see preceding abstract] in the national forests of Idaho and western Montana, to which the Forest Service is definitely committed. The scheme provides for the treatment of 293,000 acres at an estimated cost of $3,377,000; the appropriations for 1930 amount to $195,000, a sum that will permit of large-scale operations. The prospects for the protection of 1,200,000 acres of private land in the same region are less encouraging, and it is suggested that large areas may have to be

acquired by the State before the necessary control measures can be applied.

BENEDICT (W. V.) & HARRIS (T. H.). **Experimental Ribes eradication Stanislaus National Forest.**—*Journ. of Forestry*, xxix, 5, pp. 709–720, 2 graphs, 1931.

Experimental work in the Stanislaus National Forest, California, was carried out in 1926, 1927, and 1930 in connexion with Federal plans for *Ribes* eradication in order to prevent the infection of sugar pine [*Pinus lambertiana*] by blister rust [*Cronartium ribicola*: *R.A.M.*, x, p. 698 and preceding abstracts]. A satisfactory degree of efficiency has been achieved, resulting in the elimination of 89 to 95 per cent. of the original bushes. The cost of the operations is stated to be lowest on unlogged areas and highest beside streams.

OGILVIE (L.) & MULLIGAN (B. O.). **Progress report on vegetable diseases.**—*Ann. Rept. Agric. & Hortic. Res. Stat., Long Ashton, Bristol, for 1930*, pp. 127–146, [1931].

In further tests of the pathogenicity of *Fusarium martii* var. *phaseoli* on dwarf beans [*Phaseolus vulgaris*: *R.A.M.*, ix, p. 700], surface-sterilized seeds were sown in sterilized soil and watered with a suspension of the spores or soaked in a watery suspension of cultures before sowing. All the plants so infected developed large red stem lesions, from which the fungus was reisolated. The following varieties were somewhat resistant: Flageolet Victoria (Magnum Bonum), Saxony, Incomparable, Flageolet St. Andrew, and Dwarf Sharpe's Goliath.

A bacterial disease of dwarf beans is becoming increasingly important in the Evesham area, where it is known as 'rust'. The most striking symptom is a sudden wilting of the whole or part of the plant, the leaves turning brown but remaining on the plant. The wilting is due to a bacterial invasion of the vascular system. Definite, small, angular, water soaked areas surrounded by a light coloured halo occur on the leaves, or an abundance of small infections may give the leaf a scorched appearance, while characteristic, green, water soaked, later reddish lesions are found on the stem, and give out a milky-white bacterial ooze. The pods show water soaked lesions, and if infected at an early stage they become curled and twisted, and reddish-brown streaks may develop. Seeds from infected pods bear very wrinkled, maize-yellow spots on the seed-coat; under these lesions numerous bacteria are present. Tentatively, the disease has been identified as halo blight (*Bacterium medicaginis* var. *phaseolicola*) [ibid., x, p. 434]. Infected seed is the common mode of dissemination of the disease.

An investigation of diseases of broad beans [*Vicia faba*] showed that several appeared to have been confused with the chocolate spot attributed to *Bacillus lathyri* [ibid., vii, p. 214; see also viii, p. 629]. *Ascochyta fabae* was present in most of the fields, and this as well as other leaf spots was frequently followed by *Botrytis cinerea*, which often killed off the tips of the shoots.

A bacterial spot and marginal scorch of lettuces, probably identical with that caused by *Bact. marginale* [ibid., ix, p. 224],

is common in the Bristol area. A yellow organism closely resembling *Bact. vitians* [loc. cit.] was isolated from a stem rot of lettuce.

The foot rot of peas previously reported as associated with a *Fusarium* [ibid., ix, p. 700] was again very prevalent in the Evesham area. The affected plants show dark brown to purplish streaks on the lower part of the stem, especially near its junction with the roots. The stem is somewhat constricted over the affected area and easily broken at or below soil level. The disease tends to spread downwards into the roots, which develop characteristic streaking and may finally rot off. A *Fusarium* [the cultural characters of which are indicated] was constantly isolated from the diseased plants and found to agree with *F. martii* var. *pisi* [ibid., viii, p. 214]. Notes on the reaction of a number of varieties to this disease are given.

Potato sickness [ibid., x, p. 546], associated with infestation by the eelworm *Heterodera schachtii* and with *Corticium solani* as well as, frequently, *Colletotrichum atramentarium*, has become a serious trouble on allotments near Bristol. The authors consider that the part played in the causation of the disease by *C. atramentarium* should be more fully investigated.

Vegetable marrow mosaic was first observed in the Bristol province in 1928. The symptoms consist in a very marked leaf mottling which takes the form of pale yellow markings tending to run in wavy lines or circles; the leaves also become rather puckered. Affected shoots have shortened internodes and tend to branch, while the affected fruits are mottled and covered with circular wart-like areas. All the young leaves and shoots of an affected plant ultimately show the symptoms, but the older leaves remain apparently normal. Much of the young fruit dies off without developing. The disease appears to be transmitted through the seed. It is rapidly increasing in prevalence.

United States Department of Agriculture Plant Quarantine and Control Administration. Service and Regulatory Announcements, April–June, 1931.—88 pp., 1931.

The present series of announcements contains, *inter alia*, a summary of the plant quarantine regulations of Peru, the Central American countries, and Mexico.

Morocco (French zone).—*Internat. Bull. of Plant Protect.*, v, 9, p. 167, 1931.

A Vizirial Decree of 10th June, 1931, provides that dealers in insecticides and fungicides, whether raw material or compounds, must supply the precise name and composition of the products placed on sale, indicating the useful components and their percentage proportion, together with all other indications necessary for identifications.

IMPERIAL MYCOLOGICAL INSTITUTE

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WOLLENWEBER (H. W.). **'Zum Kiefernsterben in Nordwest-Deutschland'. Oedocephalum-Polyporus annosus.** [On the dying-off of Pines in north-west Germany. *Oedocephalum-Polyporus annosus.*]—*Forstarch.*, *1931*, 20, p. 391, 1931.

Further investigations are stated to have confirmed Liese's supposition that the *Oedocephalum* isolated from diseased pine roots in north-west Germany is the conidial stage of *Polyporus* [*Fomes*] *annosus* [*R.A.M.*, xi, p. 82]. Except in size, the conidial heads of the species isolated from pine appear to be identical with those of *O. glomerulosum* figured by Harz (*Bull. Soc. Nat. Moscou*, xliv, p. 120, 1871) as *Haplotrichum*.

FISCHER (E.). **Die Beziehungen zwischen Gymnosporangium confusum Plowr. auf Juniperus phoenicea und J. sabina.** [The relationships between *Gymnosporangium confusum* Plowr. on *Juniperus phoenicea* and *J. sabina.*]—Reprinted from *Ber. Schweiz. Bot. Gesellsch.*, xl, 1, 8 pp., 1931.

Continuing his investigations on *Gymnosporangium confusum* [*R.A.M.*, ix, p. 754], the writer conducted a series of inoculation experiments at Berne to ascertain the reason for the toxic manifestations produced on *Cydonia vulgaris* by the Mediterranean form of the rust from *Juniperus phoenicea,* in contrast to the Central European form from *J. sabina* which is characterized by profuse aecidial formation (practically absent in the Mediterranean form) but causes little damage to the quince host.

Inoculations on *C. vulgaris* with teleutospores from *J. sabina* caused extensive rotting of the leaves of plants kept in a warm house and this was followed in several cases by the development of swollen aecidial pustules. It was found also that the aecidiospores of the form from *J. sabina* were able to infect *J. phoenicea,* indicating that both are the same strain of *G. confusum.* The difference in virulence on *C. vulgaris* is thus not genotypical, nor is it dependent on the condition of the host, but is apparently governed by environmental factors.

POPHAM (F. J.). **Summary of results of treated experimental sleepers laid in the various railway systems of India, brought up to date.**—*Forest Bull.* 74 (Forest Res. Inst., Dehra Dun), 30 pp., 1931.

The results [which are briefly discussed and fully tabulated] of durability tests of treated railway sleepers in India begun in 1910

show that neither carbolineum Avenarius nor mixtures of zinc chloride and carbolineum are altogether satisfactory for this purpose, their failure being due to low absorption on the part of the carbolineum and to the leaching out of the zinc chloride. Considerably better results were obtained with Powell's solution (molasses and arsenic) [*R.A.M.*, viii, p. 80] and with a mixture of solignum and earth oil in the treatment of *Pinus longifolia*, *P. excelsa*, and *Terminalia tomentosa*, the average life of the last-named being extended by Powellizing from 6 to 18½ and 17 years on the Eastern Bengal and North-western Railways, respectively, while the solignum and oil treatment prolonged the life of the two *Pinus* spp. from 3 to 14 years on the North-western. Powellizing has also given satisfactory protection against fungus rots in the Karachi division, but probably the creosote and oil treatment is better suited to very humid climates.

KROHN (V.). **Die ersten Funde von Phytomonas maculicola McCulloch in Suomi.** [The first discoveries of *Phytomonas maculicola* McCulloch in Finland.]—*Phytopath. Zeitschr.*, iii, 5, pp. 531–532, 1931.

From a leaf of *Brassica oleracea* submitted to the Phytopathological Institute of Helsingfors University in the autumn of 1928, an organism was isolated corresponding in its morphological and cultural characters [which are indicated] to *Phytomonas* [*Pseudomonas*] *maculicola* [*R.A.M.*, vii, pp. 226, 563; viii, p. 120]. The spots on both sides of the leaf were blackish-brown to black, hard, surrounded by a yellowish border, and measured 1 to 2 mm. across, but were sometimes confluent. In the larger lesions the affected tissues generally fell out, leaving a grey surrounding zone. Inoculation experiments with a pure culture of *P. maculicola* gave positive results on cauliflower and Brussels sprouts, while head cabbage [*B. oleracea* var. *capitata*] remained immune. *P. maculicola* was subsequently detected on cabbage plants in south-west Karella and elsewhere in Finland.

PRESTON (N. C.). **The prevention of finger-and-toe (club-root) in gardens and allotments.**—*Journ. Min. Agric.*, xxxviii, 3, pp. 272–284, 1 pl., 1931.

This is an expanded version of the author's account of experiments on the control of the finger-and-toe disease (*Plasmodiophora brassicae*) of cruciferous crops, which have already been noticed [*R.A.M.*, ix, p. 699]. In addition to the information contained in the first paper, mercurous chloride (calomel) is stated to have given definitely encouraging results in the control of the disease, and has the advantages of very easy application and a much lower toxicity to man than mercuric chloride. Calcium cyanamide and nitro-chalk did not afford any practical measure of protection under the conditions of the tests. Emphasis is laid on the necessity of disinfecting seed-beds infected with the organism, for which purpose the use of 0.1 per cent. mercuric chloride or 2 per cent. formalin solution, at the rate of about 2 gallons per square yard, is recommended.

The cost of the mercuric chloride (1 in 2,000 solution) treatment in the field by the 'watering-in' system, and allowing half a pint

per plant, is estimated to be about 3*d*. or 4*d*. per 100 plants; where the 'dipping' method is used, the cost would be reduced to about 1*d*. per 100 plants treated, but this method appears to be definitely inferior to the other.

WENZEL (A.). **Beiträge zur Kenntnis der Blattfleckenkrankheiten der Zuckerrübe. (Dissertationsauszug.)** [Contributions to the knowledge of the leaf spot diseases of the Sugar Beet. (Abstract of a thesis.)]—*Phytopath. Zeitschr.*, iii, 5, pp. 519–529, 10 figs., 1931.

The writer summarizes the results of his observations in the Rhine Province on the leaf spot diseases of sugar beets caused by *Cercospora beticola*, *Ramularia betae* and *Alternaria tenuis* (*Sporidesmium putrefaciens*).

The results of the present investigations on the first-named disease are stated to agree in the main with those of Schmidt [*R.A.M.*, vii, p. 694]. *Ramularia betae* occurred in a parasitic form in 1928 (the first report in Germany) at Bonn, Düren, and on the Moselle [ibid., ix, p. 757]. The spots produced by this fungus closely resemble those due to *C. beticola*, except that they are distinctly paler, usually larger, and with less regular margins. The conidia of *R. betae* are uni- or bicellular, tapering at both ends, the former measuring 10 to 15 by 4 to 5 μ and the latter 15 by 5 μ. The mycelium grows very slowly, conidia developing at the apex of any free hypha. The optimum temperature for growth is 18° to 20° C. At 17° the incubation period in artificial infections was 16 to 18 days, while at 28° it was 26 days and at the latter temperature the percentage of successful infections was very low. Infection takes place through the stomata. *R. betae* (a common beet parasite in Denmark) does not normally find in Germany the optimum temperature relations for its development. The *Ramularia* spots, unlike those of *C. beticola* [ibid., viii, p. 120], are not separated by an abscission layer from the healthy areas.

When unwounded beet leaves at an advanced stage of development were inoculated with a conidial suspension of *Alternaria tenuis* (*Sporidesmium* [*Sporodesmium*] *putrefaciens*) [ibid., iv, p. 61; x, p. 293], no spotting developed, but lesions appeared on wilting leaves wounded prior to inoculation. Infection further occurred in portions of the tissue injured by dilute sulphuric acid or leaf-miners. The fungus fruited profusely on all the spots and completely destroyed the leaves in the greenhouse at a temperature of 25° and 100 per cent. humidity. Beet leaves narcotized with ethyl ether at a strength of 0·25 c.c. per l. of air were also entirely disorganized by *A. tenuis*. The results of these experiments are considered to show that *A. tenuis* is an innocuous facultative parasite, only capable of injuring the plants after their vital functions are weakened.

BRANDENBURG (E.). **Die Herz- und Trockenfäule der Rüben als Bormangel-Erscheinung.** [The heart and dry rot of Beets as a symptom of boron deficiency.]—*Phytopath. Zeitschr.*, iii, 5, pp. 499–517, 4 figs., 1931.

Recent physiological investigations [which are summarized] have

shown that boron is one of the indispensable elements of plant nutrition, the absence of which is responsible for the death of the growing point in various plants, e.g., broad beans (*Vicia faba*), tomato, and tobacco [cf *R.A.M.*, x, p. 561].

In the writer's experiments [full details of which are given] at Baarn, Holland, Eckendorfer fodder beets, raised from sterilized seed in glass vessels containing v. d. Crone's solution (P_H 6 to 7), developed the typical symptoms of heart rot [ibid., iv, p. 521 *et passim*] accompanied by more or less pronounced chlorosis of the leaves. By the addition of boric acid to the solution at the rate of 0·5 to 0·7 mg. per l. the heart rot symptoms were entirely eliminated, while manganese sulphate (1 mg. per l.) prevented the development of chlorosis.

The early symptoms of boron deficiency always appear in the youngest heart leaves, which cease to grow and often bend slightly outwards, while a blackish-brown discoloration is observed, especially on the concave side of the petioles, frequently extending to the mid-rib and lateral veins in the basal parts of the smallest leaves. In the larger leaves the veins are often somewhat yellowish instead of whitish as in normal plants. The affected petioles are extremely brittle. In the continued absence of boron the heart leaves and main growing point rapidly turn black and die, while the next older leaves wilt, turn yellow, and shrivel. At the same time numerous new shoots develop from the healthy parts of the beet, but these also become similarly diseased. The outer leaves of the plants deprived of boron are often drooping and unusually thick. The lateral roots of affected plants are generally brownish, very short, and die off at the tips, while the many new ones formed to replace them cease to grow on reaching the length of a few millimetres.

These symptoms agree with those occurring under field conditions. The actual dry rot symptoms also developed in the roots of beet plants grown in water cultures without boron. The affected tissues showed a diffuse, very marked, brown to black discoloration, accompanied in the advanced stages by desiccation and necrosis. In very rare cases the exterior cambial zone lower down on the root was also involved, as described by Krüger and Wimmer [ibid., vii, p. 759]. No trace of infection by *Phoma betae* was detected in the water culture plants, and although this fungus was very often isolated from advanced cases of heart rot in the field, it is considered to be of little or no importance in the etiology of the disease.

In a small-scale pot experiment, in which fodder beets growing in sandy humus soil were supplied, immediately on the appearance of boron deficiency symptoms, with boric acid at the rate of 5 mg. per 8 kg. soil, complete recovery was effected, while in the untreated control plants the disease pursued its natural course as described above.

The 'late blight' of sugar beets recently reported from the United States [ibid., x, p. 576] is considered, from the account of the symptoms and the accompanying figures, to be distinct from heart and dry rot.

[A condensed version of this paper is published in *Angew. Bot.*, xiii, 5, pp. 453–456, 1931.]

MIKLASZEWSKI (S.). **Dry rot of Sugar Beet in relation to soil conditions.**—*Proc. Internat. Soc. Soil Sci.*. iv, pp. 75–77, 1931. [Abs. in *Journ. Soc. Chem. Ind.*, l, 44, p. 990, 1931.]

Dry rot of sugar beets [see preceding abstract] is stated to occur only in alkaline soils in Poland. It is immaterial whether the alkalinity is natural or induced by liming. The development of the disease is partially related to the proportionately lower water content of the alkaline soils.

MOORE (W. D.). **Pod blight of Lima Beans in North Carolina and Virginia.**—*Plant Disease Reporter*, xv, 11, pp. 113–114, 1931. [Mimeographed.]

In August, 1931, the writer observed an apparently new disease of Lima beans [*Phaseolus lunatus*] in a 20-acre field at Goldsboro, North Carolina. The causal organism of the disease has not yet been accurately determined but is similar to *Colletotrichum caulicola*. In the early stages the pods show small reddish streaks and blotches which rapidly expand. Later the infected areas turn light brown to greyish and numerous fruiting bodies develop on the surface, while the branches are also girdled and killed. The pod spot fungus (*Diaporthe phaseolorum*) [*R.A.M.*, iv, pp. 82, 136] was often found in association with that of pod blight. Subsequently the disease was found causing up to 100 per cent. infection in the Norfolk district of Virginia, where the stems also were generally involved. Pod blight may cause the loss of the entire crop.

MOORE (W. D.). **Ashy stem blight on Lima Beans in North and South Carolina.**—*Plant Disease Reporter*, xv, 11, pp. 114–115, 1931. [Mimeographed.]

During the summer of 1931 a three-acre field of Lima beans [*Phaseolus lunatus*] near Lake City was found to be heavily infected by ashy stem blight (*Macrophoma* [*Macrophomina*] *phaseoli*) [*R.A.M.*, ix, p. 82], this being apparently the first record of the disease in the State. In some cases the entire plant was killed and numerous typical pycnidia developed on the ashy-white areas of the dead stems. Ashy stem blight further occurred in a milder form in the Wilmington district. Owing to the resemblance between this disease and the pod spot due to *Diaporthe phaseolorum* [see preceding abstract], it is possible that confusion may have arisen in certain cases, and that ashy stem blight is more generally present than the records show.

KAWAMURA (E.). **A leaf spot of Vigna catjang var. sinensis, caused by Cercospora vignicola n. sp.**—*Fungi (Nippon Fungological Soc.)*, i, 1, pp. 14–20, 1 fig., 1931. [Japanese, with English summary.]

Cowpea (*Vigna catjang* var. *sinensis*) has been attacked in Fukuoka, Japan, by a new disease the symptoms of which are the appearance of circular, concentrically zonate spots with reddish-brown rings, 4 to 8 mm. in diameter, on the leaves, and long, dark reddish brown lesions on the stems. The causal organism, which is named *Cercospora vignicola* n. sp., is characterized by simple, erect, dark brown conidiophores (paler towards the apex), arising

singly or in fascicles from the diseased areas, sometimes constricted at the septa, of which there are 1 to 7, and measuring 50 to 228 by 6 to 9 μ, and by terminal, obclavate, occasionally cylindrical, straight, or slightly curved, light brown conidia, tapering towards the apex, 2- to 21-septate, measuring 80 to 252 by 10 to 22 μ.

UPPAL (B. N.). **India: a new virus disease of Dolichos biflorus.** —*Internat. Bull. of Plant Protect.*, v, 9, p. 163, 1931.

In 1930 *Dolichos biflorus* at the College Farm, Poona, was observed to be severely affected by a new virus disease resembling bean (*Phaseolus vulgaris*) mosaic and characterized by chlorosis, clearing of the veins, blistering, and downward cupping of the pinnately trifoliate leaves, shedding of flowers, and extensive sterility of the pods. The disease is reported to be very serious and generally prevalent in the Bombay Presidency and has further been found causing heavy damage to *D. lablab* in Gujarat. The infective principle was found to be transmissible through the seed of *D. biflorus*, up to 25 per cent. of seed infection being found in different seed lots purchased from the market.

LABROUSSE (F.). **L'anthracnose du Pois-Chiche.** [Anthracnose of Chick Pea.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 6, pp. 226–231, 1931.

In further investigations into the disease of chick peas (*Cicer arietinum*) formerly attributed to *Phyllosticta rabiei* [*R.A.M.*, x, p. 7; xi, p. 23] the author observed that 2 to 4 per cent. of the spores in the pycnidia which developed on inoculated plants were bicellular and considers that the fungus should be referred to the genus *Ascochyta*, which also establishes a more satisfactory connexion between it and the diseases of common peas caused by *A. pisi*, *A. pinodella* [ibid., xi, p. 17], and *A. pinodes*. All of these have as a common characteristic the production of similar lesions on the stems and foliaceous organs, whereas *Phyllosticta* comprises only leaf-attacking species. *Ascochyta* is preferred to *Diplodina* because the latter includes only stem-attacking species, and also on the ground of priority. The author accordingly proposes the name *A. rabiei* (Passerini) nov. comb. for the chick pea organism.

In a field test rows of chick peas were planted alternately with rows of *Vicia faba*, *V. sativa*, *V. hirta*, *V. macrocarpa*, *Lathyrus sylvestris*, garden peas, and lentils, and fragments of chick peas killed off by the disease were deposited on the rows. As soon as the plants showed above the soil all the chick peas were killed, but the rest continued to be unaffected in spite of repeated sprinkling with an aqueous suspension of the spores of *A. rabiei* [cf. ibid., x, p. 8].

On carrot agar *A. rabiei* forms a scanty, cream-white mycelium with numerous pycnidia blackening the medium; the spores are a very pale pink, almost white in the mass. Under identical conditions, *A. pisi* forms an abundant rose-pink mycelium; the pycnidia are of a light colour and the spores in the mass are a bright carrot red.

Of 36 different types of chick peas inoculated with *A. rabiei* three remained almost completely unaffected in spite of repeated sprinkling with an aqueous suspension of the spores; two of these

types are fit for human consumption while the third is suitable for feeding to animals. Further efforts to discover resistant types are in progress.

FOISTER (C. E.). **The white tip disease of Leeks and its causal fungus, Phytophthora porri n. sp.**—*Trans. & Proc. Bot. Soc. Edinburgh*, xxx, 4, pp. 257–281, 3 figs., 1931.

This is a detailed morphological, cultural, and taxonomic account of the species of *Phytophthora* causing the so-called 'white tip' disease of leeks in Scotland [*R.A.M.*, viii, p. 543], subsequently reported also from England [ibid., x, p. 638]. The organism was shown to be capable of growing saprophytically in the soil, but there was no evidence that it attacks the roots and bases of the leek plant, infection experiments indicating that it gains entry to the host tissues through the aerial parts of the plants, to which the spores are carried by air currents. Inoculations of the leaves gave 29 per cent. infection on unwounded and 77 per cent. on slightly injured plants, and 18 per cent. of the leeks growing in proximity to diseased ones also contracted infection.

On quaker oat agar the fungus produces a dense, white mass of aerial hyphae but not much submerged mycelium; sexual organs are formed in the medium and on the aerial hyphae, where conidia are also produced. The mycelium is branched, continuous when young, but septate when old, very unequal in width, ranging from 2·4 to 12 μ, with an average of about 6 to 8 μ in diameter, and the hyphae have a great tendency to coil into spirals, particularly in the region of sexual activity; they also often develop large, long swellings which do not represent any form of spore. The sexual organs are produced very readily in the diseased tissues of leeks, and in several culture media. The antheridia are either para- or amphigynous (the predominance of either type depending on the nature of the culture medium), oval or applanate-spherical, terminal or intercalary, not on the same hypha as the oogonium; when amphigynous they range from 7·3 to 19·4 μ (average 12·5 μ) and when paragynous from 7·3 to 10 μ in diameter. The mature oogonia are spherical, with an irregularly thickened wall, ranging from 29 to 46 μ (average 38 to 39 μ) in diameter. The oospores are spherical, honey-yellow when old, with a wall 3 to 4·5 μ thick, and measure from 22 to 39 μ (average 32 to 33 μ). The conidia (which are produced abundantly in water and on the host) are obpyriform or oval, terminal or intercalary, usually without a papilla, but occasionally with a broad or beaked papilla, and measure 31 to 82 by 23 to 52 μ (average 51 by 35 μ); they germinate either by a germ-tube or by zoospores, 10 to 15 μ in diameter, which in their turn may germinate either by a tube or by forming further zoospores (repetitional diplanetism) [ibid., ix, p. 611]. The temperature relations for growth in culture were found to be: minimum below 8° C., optimum 25°, maximum 35°, and thermal death point at or slightly below 40°.

A comparison of this species with other forms [the measurements of which are presented in tabular form] leads the author to consider it as new to science, and the name *P. porri* is suggested for it. Latin and English diagnoses are appended.

ALEXANDER (L. J.) & YOUNG (H. C.). **Control of powdery mildew and red spider on greenhouse Cucumbers.**—*Science*, N.S., lxxiv, 1917, pp. 314–315, 1931.

The results of one season's tests at the Ohio Agricultural Experiment Station in the combined control of powdery mildew of greenhouse cucumbers (*Erysiphe cichoracearum*) [*R.A.M.*, x, p. 702] and red spider (*Tetranychus telarius*) indicate that spraying with hydrophilic colloidal sulphur (Anzul Chemical Company) [ibid., ii, p. 461] is very effective for this purpose. The applications were made on 11th, 20th, and 27th April and 4th May, 1931, at varying strengths up to 4 lb. of the paste to 100 galls. of water; a strength of 2 lb. to 100 galls. is recommended as both safe and efficacious. The use of penetrol [ibid., x, p. 225] as a spreader resulted in severe leaf scorch.

MULLER (H. R. A.). **Mozaiekziekte bij Cassave.** [Mosaic disease of Cassava.]—*Inst. voor Plantenziekten Bull.* 24, 17 pp., 8 pl., 1931. [French summary.]

Cassava (*Manihot utilissima*) at Buitenzorg (Java) was observed, in 1930, to show symptoms of mosaic identical, according to M. Pascalet, to whom specimens were submitted, with that already described on this host in the French Cameroons [*R.A.M.*, x, p. 639]. The disease is also believed to be the same as that termed 'Kräuselkrankheit' by Zimmermann in East Africa and with the mosaic of cassava found by Deighton and McKinney in West Africa [ibid., ix, pp. 19, 260].

The basal leaves of the affected plants at Buitenzorg appear normal, but those immediately above show a pale green to yellowish-green discoloration, sometimes affecting only half a segment or only one or two segments of a leaf. In the upper leaves more especially, the diseased parts are much reduced in size, the leaf blade consisting merely of a narrow strip along the main vein. The affected leaves often show marked curling and distortion, and the internodes are much shortened, giving the plants a stunted appearance. Very often most of the eyes on the stem grow out so that the stem bears an unusual number of lateral branches. Seedlings derived from the Brazilian 'Mangi' strain appear to be particularly susceptible to mosaic, which was found to be transmissible through cuttings.

In a note by Pascalet on the occurrence of cassava mosaic in the Cameroons [which is appended] it is stated that the average yield of a diseased crop amounts to only 15 quintals per hect. as compared with 70 to 80 quintals for a healthy one. The disease is highly infectious, and soils on which it has occurred should not be used again for cassava cultivation until a number of years have elapsed. It is suggested that scale insects (*Lecanium* sp.) and termites may act as vectors. When a healthy cassava scion is grafted on to a diseased stock and vice versa the healthy part contracts mosaic. Both sweet and bitter cassava varieties are liable to this disease, but some of the latter show a certain amount of resistance. Progress has further been made in the Cameroons in the development of resistant varieties from material received

from Central America and certain French colonies where the disease does not occur. Cassava mosaic is less severe on fresh forest soils than on those that have long been cleared. The effects of the disease may be counteracted to some extent by heavy manuring.

A table is given showing the differences between the symptoms of cassava mosaic and those of infestation by the mite, *Tetranychus bimaculatus*.

CHABROLIN (C.). **Importance économique des maladies parasitaires des cultures arbustives en Tunisie.** [Economic importance of parasitic diseases of arborescent cultures in Tunis.] —*Rev. Path. Vég. et Ent. Agric.*, xviii, 7, pp. 259–264, 1931.

In this brief review of the parasitic diseases that attack the olive, fruit trees, and the vine in Tunis, the author states that the warm Mediterranean climate in that country, wet in winter but rapidly warming up and drying in the spring, prevents a dangerous development of most of the fungal parasites, thus doing away with the necessity of routine control. The only exception is *Oidium* (*Uncinula necator*) of the vine, which regularly recurs every year and, unless checked by adequate treatment, would probably cause considerable losses. Vine mildew (*Plasmopara viticola*) is usually of little economic importance, but epidemics occurred in 1915 and 1921, showing that the disease is always present in the country and needs careful watching; under normal conditions, an early spraying of the young grape bunches is considered to afford sufficient protection against this disease.

MARSAIS (P.). **Bouillies mouillantes et adhérentes.** [Wetting and adhesive spray mixtures.]—*Rev. de Vitic.*, lxxiv, 1927, pp. 357–361, 1931.

After a few theoretical considerations on the best methods of increasing the wetting and adhesive properties of fungicidal sprays, with particular reference to cupric mixtures for the control of vine mildew [*Plasmopara viticola*], the author states that, as wettability is a function of the surface tension of the liquid, and the lower this tension the smaller the drops that flow from a calibrated drop glass with capillary orifice, such as Duclaux has used for alcohol mixtures, a fairly accurate empirical method of determining the degree of wettability of a cupric spray is by counting the number of drops from a given volume of the liquid. Thus, 5 c.c. of an efficient mixture should give from 135 to 150 drops at 15° C., the number of drops decreasing in direct proportion with decrease in the wetting capacity of the fluid. Adhesiveness is a distinct, though somewhat allied property, depending on the viscosity of the liquid. There are several suitable and well-known substances that can be added to the spray mixtures to increase this property.

As regards their application, the mixtures should be sprayed in the shape of a strong, penetrating (not spreading) jet, capable of reaching the grape bunches and entering between the individual berries [cf. *R.A.M.*, x, p. 773].

BICHET (R.). **Poudres cupriques et rots du Raisin en Beaujolais.** [Cupric dusts and Grape rots in Beaujolais.]—*Prog. Agric. et Vitic.*, xcvi, 34, pp. 181–185, 1931.

In view of the fact established in recent years that cupric dusts afford better protection to grapes against various rots, more particularly those caused by vine mildew [*Plasmopara viticola*], than cupric sprays, the author investigated the results obtained in 1930 in Beaujolais [central France] by applications of two of these dusts, namely, tetracuprite which contains 1·25 per cent. metallic copper, and is a mixture of polybasic copper sulphate, talc, and adhesol powder; and chefdebien, an intimate mixture of copper sulphate and talc, with 2·5 per cent. metallic copper content. Both dusts have a distinctly acid reaction. The doses applied varied from 15 to over 100 kg. per hect. at each dusting, the dose recommended by the makers of chefdebien being 50 to 60 kg. in normal years; there was distinct evidence that the lower doses were quite ineffective. With the higher doses both dusts gave equally good results, a noteworthy feature being that tetracuprite, which contains only half as much metallic copper as chefdebien, was at least as effective as the latter. The market price of the two dusts is practically the same, and the application of 50 kg. of either per hect. is calculated to have cost 65 francs.

The author considers that dusting the grapes may be started after the end of the flowering period, since sufficient protection is afforded until that time by the routine spraying. The investigation also showed that vine mildew cannot be efficiently controlled by dustings alone; when intercalated between sprayings they are a powerful aid in the struggle against the disease, and in this case the sprayings may be safely reduced by one or two applications during the season.

BRANAS (M.). **Le mildiou sur les producteurs-directs en 1930 à l'École Nationale d'Agriculture de Montpellier.** [The mildew on self-rooted Vine hybrids in 1930 at the National Agricultural School at Montpellier.]—*Prog. Agric. et Vitic.*, xcvi, 29, pp. 56–61, 1931.

The author states that the severe vine mildew [*Plasmopara viticola*] outbreak in France in 1930 enabled useful observations to be made at the National Agricultural School of Montpellier on the relative resistance to the disease of over 300 vine hybrids which are grown for wine production on their own roots, and none of which was treated against mildew during that season. The results [some of which are given in tabular form] showed that the hybrids possess certain properties not present in the *Vitis vinifera* parents. Thus, the different organs of the hybrid may exhibit varying degrees of susceptibility, sometimes diametrically opposed to each other, e.g., resistant foliage and susceptible grape bunches or vice versa. Susceptibility of the leaves to spring and summer attacks of the fungus was shown to be distinct from, and independent of, the susceptibility to autumn attacks, since hybrids which remain free from early infections may contract mildew in the autumn, the reverse also being true. Differences were also noted in the relative

susceptibility of the different parts of the inflorescence, the corolla being the most susceptible, and the rachis the least; frequent cases were observed, however, in which a severe infection of the corolla did not spread to the fruit. The observations showed finally that the relative resistance of a new cross cannot be foreseen in advance, and can be established only experimentally.

ARMET (H.). **Calcium et mildiou.** [Calcium and mildew.]—*Prog. Agric. et Vitic.*, xcv, 15, pp. 355–359; 16, pp. 378–382, 1931.

After pointing out that during the severe epidemic of downy mildew of the vine (*Plasmopara viticola*) which broke out in France in 1930 [*R.A.M.*, x, p. 579 and preceding abstract] certain vine varieties as well as certain parts of single vines remained unaffected, and that damp, low-lying situations and areas rich in calcium were least affected, the author states that in his opinion vines possess what he terms an 'internal' resistance to mildew, dependent on the type of the stock and graft and certain properties of the soil.

This internal resistance is conditioned in the first place by the calcium content of the aerial organs, which depends upon the amount of calcium present in the soil and its availability. An excess of calcium in the soil, by inducing chlorosis, is harmful to those vines which readily absorb this element, such as Riparia and the P.D. hybrids. Rupestris and similar stocks, as well as the native [*Vitis vinifera*] varieties, take up very little calcium flourish in soils rich in this element, and are highly susceptible to mildew.

That mature leaves remain unaffected while young ones are susceptible is considered to be due to the fact that the former contain more calcium than potassium, while in the latter the reverse obtains. The calcium : potassium ratio of the plant juices varies directly as the resistance of the organ to mildew. This ratio is much smaller for the berries than for the leaves, in which the calcium : potassium ratio becomes greater than unity about flowering time and increases rapidly from 1st July until 15th August, after which it declines. This period of rapid increase coincides with an increasing resistance in the leaves to *P. viticola*, while during the final decrease of the ratio they again become susceptible. In the berries the calcium : potassium ratio decreases during the critical period for the development of the grey rot of the berries due to *P. viticola*, i.e., from 15th June to 1st July; the ratio then increases until 15th July, to decline again during the ripening period which coincides with the critical period for the brown rot form of the disease.

The high soil humidity of rainy seasons renders the calcium and potassium more easily available; the proportion of each element taken up depends on the type of the vine and the physico-chemical constitution of the soil. Whether the results will be favourable or otherwise upon the aerial organs of the vine depends on (1) the mobility of the potassium in the plant tissues, and (2) the anti-coagulating action of the potassium on the plant sap, in opposition to the coagulating effect of the calcium. In vigorous

vines, where the sap is very fluid and rich in potassium, these two factors contribute to activate the vitality and the osmotic and nutritive exchanges which take place. In weak vines, on the other hand, in which the sap is poor in potassium and rich in calcium, these two factors act in opposition, reducing the vitality of the vines. This view is considered to confirm that recently expressed by Ravaz as to the effect of sap concentration upon fungal diseases of the vine [ibid., x, pp. 581, 640].

In very rainy years, as in 1930, the calcium : potassium ratio is probably more reduced as regards the berries than the leaves, and this would largely account for the marked susceptibility of the berries that was noticed at the different stages of their growth.

SĂVULESCU (T.). **L'état phytosanitaire en Roumanie durant l'année 1929–1930.** [Phytosanitary conditions in Rumania during the year 1929–1930.]—*Ann. Inst. Recherches Agron. de Roumanie*, iii, pp. 240–256, 1931.

Among other items of phytopathological interest in this report [cf. *R.A.M.*, x, p. 77] the following may be mentioned. *Puccinia triticina* was observed on Cenad 117 wheat on 29th April, an exceptionally early date for Rumania, and was followed 15 to 20 days later by *P. graminis* and *P. glumarum*. Wheat bunt (*Tilletia laevis*) [*T. foetens*] caused losses of 8 to 10 per cent. in untreated stands; *T. tritici* [*T. caries*] was of rare occurrence during the period under review.

Phytophthora nicotianae occurred on tobacco in the department of Orhei (Bessarabia). The appearance of *Peronospora hyoscyami*, already reported on tobacco from the Ukraine [ibid., ix, p. 2], may shortly be anticipated in Rumania, where the mildew is known to occur on *Hyoscyamus*. Leaf spotting of tobacco was caused almost exclusively by *Phyllosticta tabaci* [ibid., x, p. 692]. Considerable losses were caused by leaf necrosis of tobacco due to the *Alternaria* previously recorded by Preissecker in Hungary and various parts of the Balkans in 1916 (*Tabaksregie*, Vienna, 1–3) under the name of *A. brassicae* var. *tabaci* Preiss., the dimensions of the conidiophores being given by him as 12 to 50 by 4 to 6 μ and those of the 3- to 11-septate conidia as 30 to 107 by 7 to 16 μ (average 50 to 70 by 10 to 15 μ). The measurements of the Rumanian specimens were as follows: conidiophores 12 to 50 by 4 to 6 μ, 3- to 10-septate conidia 28 to 90 (average 40 to 50) by 10 to 15 μ; they thus approximate very closely to those given recently by Gulyás in Hungary for *A. tabacinum* (Ell. & Ev.) Gulyás [ibid., x, p. 212; cf. also xi, p. 77], with which *A. brassicae* var. *tabaci* is thought to be probably identical. The disease appeared immediately after transplanting and reached a climax early in August, after which sporadic infections occurred until September.

The elm disease caused by *Graphium ulmi* has been observed in the forests and avenues of Rumania for the last two years. It is widely distributed in the Bucharest district and probably occurs throughout the country.

Notes are also given on diseases of miscellaneous vegetable crops, vines, fruits, and ornamental plants.

Zpráva o škodlivých činitelích kulturních rostlin v Republice Československé v roce 1929–1930. [Report on the agencies injurious to cultivated plants in the Republic of Czecho-Slovakia in the year 1929–30.]—*Ochrana Rostlin*, xi, 1–2, pp. 1–88, 8 figs., 1931.

In this report [which is compiled on the same lines as that for the preceding year: *R.A.M.*, x, p. 75] A. Šeda states that meteorological conditions in the 1929–30 season led to severe attacks of brown and black rusts (*Puccinia dispersa* [*P. secalina*] and *P. graminis*) on rye, bunt (*Tilletia tritici*) [*T. caries*] on wheat, and crown and black rust (*P. lolii* and *P. graminis*) on oats. Rye, wheat, and barley also suffered fairly severely in some localities from *Ophiobolus herpotrichus* and *Erysiphe graminis*, and wheat from *Septoria tritici*.

Rambousek reports for the first time in Czecho-Slovakia the occurrence of beet mosaic [ibid., xi, p. 89], the symptoms of which are briefly described. Attempts to transmit this disease artificially failed. Cucumbers (*Cucumis sativus*) suffered heavily from seedling blight (*Pythium de Baryanum*), leaf and fruit blight (*Cladosporium cucumerinum*), and downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*). Vine mosaic was again prominent in Mělník [ibid., x, p. 76].

Magerstein reports that plantations of basket willow [*Salix* spp.] were chiefly attacked by crown gall (*Bacillus* [*Bacterium*] *tumefaciens*) and root rot (*Rhizoctonia violacea*) [*Helicobasidium purpureum*]. *Rhytisma salicinum* was prevalent mainly on *S. purpurea*, and rust (*Melampsora* sp.) on *S. viminalis*.

The above are only a few of the numerous phytopathological records contained in this report.

MORWOOD (R. B.). **The work of the Pathological Branch.**—*Ann. Rept. Queensland Dept. of Agric. and Stock for the year 1930–1931*, pp. 47–48, 1931.

The following are among the items of interest in this report. Heart rot of bananas, a recently reported virus disease transmitted by the banana aphid [*Pentalonia nigronervosa*: *R.A.M.*, x, p. 472], has been found in various localities from Yeppoon to the southern border of the State. The symptoms are apparently masked during the cooler months of the year.

Papaws suffered severely from yellow crinkle, which is apparently due to a virus and spreads rapidly during the summer, eventually causing the rotting down of the stem.

A small localized occurrence of green rot of apricots (*Sclerotinia sclerotiorum* [ibid., x, p. 605] constitutes a new record for the State.

Diplodia macrospora has been found to be involved in the cob rot of maize in addition to *D. zeae* [ibid., x, pp. 223, 238; xi, p. 97].

HECTOR (G. P.). **Annual Report of the First Economic Botanist to the Goverment of Bengal for the year 1930–31.**—*Ann. Rept. Dept. of Agric. Bengal for the year 1930–31*, pp. 35–44, 1 map, 1931.

The following items of phytopathological interest occur in this

report. Good control of the *Phytophthora* disease of the betel vines [*Piper betle*] at the Dacca Farm was obtained by five applications of 1 per cent. resin-Bordeaux mixture, beginning on 12th May, 1930, combined with the use of healthy cuttings steeped for two minutes in 1 per cent. Bordeaux mixture [*R.A.M.*, x. pp. 223, 585]. Promising results have been given in several localities by soil sterilization with kerol (1 in 800) for the control of *Sclerotium rolfsii* and *Rhizoctonia* on betel vines, against which spraying is ineffective. A species of *Phytophthora* caused a brown discoloration and wilting of *Hibiscus sabdariffa* var. *ultissima* at the Dacca Farm. *H. cannabinus* and *Abutilon* sp. were attacked by *S. rolfsii*.

S. oryzae caused lodging of rice (early transplanted winter varieties) at Dacca and in Northern Bengal, up to 5 per cent. damage being recorded. In some cases the progress of the disease was arrested by draining off the standing water and letting the fields dry out. The following preventive measures have been recommended: burning of stubble in the fields after harvest [cf. below, p. 159], frequent ploughing, application of lime in small quantities, and cultivation of the apparently immune Departmental variety Dudshar.

At Krishnagar Farm the early sown tobacco beds were attacked during the cold weather by *Pythium de Baryanum*, and at Dacca *Asclepias* plants were infected by a species of *Fusarium* causing a blackening and wilting of the collar.

S. rolfsii was responsible for two diseases of ganja [*Cannabis sativa*], in one of which infection begins at the stem base while in the other the plant wilts from the top downwards; in both cases the plants were killed.

NARASIMHAN (M. J.). **Report of work done in the Mycological Section during 1929–30.**—*Admin. Rept. Agric. Dept. Mysore for the year 1929–30*, pp. 21–24, 1931.

Spraying for the control of areca [*Areca catechu*] koleroga (*Phytophthora*) [*arecae*] was carried out over an area of 5,172 acres in Mysore during the period under review, the total cost of the transactions amounting to about Rs. 17,231 [about £1,290]. Good results were again given by alum Bordeaux mixture [*R.A.M.*, viii, p. 704] over an area of some 259 acres; linseed oil at the rate of 2 fluid oz. per lb. of solid in the mixture acted as a very satisfactory adhesive, withstanding exposure to the August rainfall of 24 inches [ibid., xi, p. 41]. About 30 to 40 areca palms on the Marthur farm showed yellowing and dying of the tops from October, 1929, onwards, the causal organism apparently being a species of *Phytophthora* behaving similarly in culture to *P. arecae*. When paired cultures of the top rot *Phytophthora* were made with *P. arecae* and the *Phytophthora* from sandal [*Santalum album*], oospores developed in the sandal pair but not in the areca pair [ibid., ix. p. 684].

Smut [*Ustilago eleusinis*] of ragi [*Eleusine coracana*] was first observed about 1920 in the Dodballapur and Chikballapur districts, whence it has spread to a number of others, but only one report of serious damage has been received. Experiments in the

control of the disease in 1923–4 by steeping the seed-grain in various disinfectant solutions gave inconclusive results [ibid., vi, p. 78].

Of recent years the potato disease caused by *Alternaria solani* has assumed epidemic proportions. Good control has been given by the application of 0·5 or 1 per cent. Bordeaux with casein when the crop is 20 days old and again at six weeks or two months.

McDONALD (J.). **Annual Report of the Senior Mycologist for 1930.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1930*, pp. 206–216, 1931.

Of nine collections of wheat stem rust (*Puccinia graminis tritici*) in 1930, eight were found to be one or other of the two physiologic forms, K1 [21] and K2 [17], already known to occur in Kenya [*R.A.M.*, x, pp. 508, 713], while the ninth, obtained from a plot of Reliance wheat at Njoro, proved to be a new form for the country. The Kanred and Reliance varieties, both of which are highly resistant to the K1 and K2 forms of *P. graminis*, were susceptible to the new form (K3).

A marked reduction of infection with the coffee berry disease caused by *Colletotrichum coffeanum* [*Glomerella cingulata*: ibid., x, p. 297] was noticed in two estates where the coffee bushes had been given heavy dressings of nitrogen, potash, phosphate, and farmyard manure, together with a small quantity of lime, fifteen months earlier. The fungus survives for 24 hours at 35° C., but failed to resume growth at normal temperatures after 27 days at 35°. At about 40° the organism was killed within three days. *Pestalozzia funerea* [ibid., vii, pp. 39, 426; viii, pp. 526, 814] occurred on the stem bark of a number of coffee seedlings, which did not appear, however, to be injured by the fungus.

The first record of *Diplodia zeae* on maize in Kenya was in 1929, and in 1930 it was again found in two localities but causing much less damage to the ears than that found in countries where the disease is serious.

Helminthosporium sativum [ibid., x, p. 373] was isolated from barley leaves at the Scott Agricultural Laboratories.

New plant disease records for Kenya in 1930 include circular [leaf] spot of apples (*Phyllosticta pirina*) [ibid., viii, p. 487]; rust (*Puccinia porri*) of garlic (*Allium sativum*) [ibid., x, p. 499]; red stripe disease of sugar-cane (*Phytomonas rubrilineans*) [ibid., x, p. 338; xi, p. 4]; and leaf spot [*Septoria cucurbitacearum*) of pumpkin (*Cucurbita pepo*) [ibid., iv, p. 467].

Plant pathology.—*Forty-third Ann. Rept. Arkansas Agric. Exper. Stat. for the fiscal year ending June 30, 1931* (*Bull.* 268), pp. 57–64, 1931.

This report contains, *inter alia*, the following items of interest. Species of *Alternaria* and *Helminthosporium* were again isolated by D. G. Carter and E. C. Tullis from Supreme Blue Rose, Fortuna, and Calora Jap rice kernels taken from plants affected by seedling blight [*R.A.M.*, x, p. 162]. The results of attempts to control stem rot of rice [*Sclerotium oryzae*] by burning the stubble before

ploughing showed an average of 17·1 per cent. stem rot on the burned-over plots compared with 40 and 42·7 per cent., respectively, on fertilized and unfertilized control plots.

Further experiments in the control of cotton wilt [*Fusarium vasinfectum*: ibid., x, p. 162] by V. H. Young, J. O. Ware, and G. Janssen showed that the incidence of infection is materially reduced by applications of kainit or muriate of potash, while mineral fertilizers not containing potash and also cotton-seed meal were ineffective. An extremely severe type of 'rust' or potash hunger was found to yield to applications of stable manure at the rate of 10 tons per acre accompanied by fairly liberal supplies of potash. It was found that wilt was not reduced on silt loam soil by treatment with potassium chloride, potassium sulphate, and kainit at a rate equivalent to 300 lb. per acre. On the 'rust sick' soil, however, the incidence of wilt was reduced from 30 per cent. to a trace, and that of rust from 80 to 5 per cent. by large applications of potassium chloride (320 and 640 lb. per acre). In the greenhouse the symptoms of cotton 'rust' were even more effectively eliminated by an application of manure at a rate equivalent to 12 tons per acre. V. H. Young found that the early development of cotton wilt is severely retarded by low soil temperatures, while possibly the high ones of late July and early August, coupled with low rainfall, may exert a similar but slighter influence.

Further studies were made by H. R. Rosen on fireblight of apples and pears (*Bacillus amylovorus*) [ibid., x, p. 111]; the disease was more destructive on the former host in Arkansas during 1930 than in any year for which records are available. In some orchards of susceptible varieties practically every blossom was killed, while the loss on these varieties as a whole is estimated at some 30 per cent. for the State. Pears, on the contrary, remained practically free from blight. An organism has several times been isolated from diseased pear material which shows marked cultural and physiological differences from the ordinary strains of *B. amylovorus* and, in fact, more closely resembles *B[acterium] nectarophilum* Doidge, *Pseudomonas prunicola* Wormald [ibid., xi, p. 58], and *Bacillus barkeri* Berridge [ibid., xi, p. 22]. There seems to be no correlation between the first blossom blight on the common susceptible apple varieties grown in the Ozarks of Arkansas and Missouri and the overwintering of the causal organism in diseased twigs and limbs. Good evidence is available, however, that the later form of twig blight, usually observed during the first half of July, may be traced to the previous year's blight in any apple orchard where the disease is prevalent.

Report of the Director for the year ending October 31, 1930.— *Connecticut Agric. Exper. Stat. Bull.* 322, pp. 111–150, 10 figs., 1931.

The following items of phytopathological interest occur in this report. Mature nuts from chestnut sprouts and seedlings were apparently more common in Connecticut during the period under review than in any year since the appearance of the blight [*Endothia parasitica*: *R.A.M.*, x, p. 696]. This does not, however,

imply resistance on the part of the tree, for all those individuals that were living when the first attacks of the fungus occurred are now dead. Sprouts arise from some of the stumps and succumb to the disease in four or five years, or seedlings may reach a height of 15 or 20 ft. before gradually contracting infection and dying.

A species of *Helminthosporium* has caused severe damage to lawns and golf courses, especially those recently sown with creeping bent [*Agrostis stolonifera*]. The symptoms are quite different from those of the common brown patch [*Corticium solani*: ibid., ix, p. 363], the grass presenting the appearance of having been matted down with oil, while the dead leaves show black spots. Spraying with Bordeaux mixture gave satisfactory control.

In the spring of 1930 apple scab [*Venturia inaequalis*] developed some five weeks ahead of its normal time, i.e., about 25th March, but owing to the drought infection was not so heavy as might have been expected. The ascogenous stage of the fungus was obtained in pure culture for the first time in the Station laboratory. A spray warning service is maintained by the County Farm Bureaux in co-operation with the Experiment Station. The best of the seven combined insecticides and fungicides tested mainly for spray injury (all quantities calculated for 100 galls. water) were: (1) 6 lb. dry lime-sulphur, 3 lb. lead arsenate; (2) sulfocide-scalecide applied at the rate of 1 gall. scalecide and 1½ galls. sulfocide at the pre-pink stage and ½ gall. sulfocide, 2 lb. lead arsenate, and 2 lb. kayso in summer; and (3) 10 lb. hydrated lime and 1 qt. fish-oil (except for scab on McIntosh). The following schedule was also satisfactory, except for russeting on Baldwin: delayed dormant, 8 lb. oxo-Bordeaux [ibid., x, p. 224], 5 galls. scalecide; pre-pink, 8 lb. oxo-Bordeaux; calyx, 6 lb. dry lime-sulphur; and summer, 8 lb. oxo-Bordeaux.

The attacks of the willow scab fungus [*Fusicladium saliciperdum*: ibid., ix, p. 500] appears to be diminishing in severity. In the village of Norfolk all the trees of *Salix alba* var. *vitellina* are dead with the exception of four sprayed in an experiment with Bordeaux mixture or lime-sulphur. The perfect stage of the fungus [*Venturia chlorospora*: ibid., x, p. 139] was obtained in culture for the first time; it has not yet been found in nature. The ascospores appear to differ from those described and figured by Aderhold.

During the summer of 1930, currant and gooseberry (*Ribes*) bushes were eradicated over 42,244 acres in 13 towns, an operation which is estimated to have protected some 14,500 acres of white pine [*Pinus strobus*] from blister rust [*Cronartium ribicola*: ibid., xi, p. 143]. Where the original eradication was carried out five or ten years ago, bushes have sprung up from the root-crowns or from seeds, necessitating fresh clearances.

Report of the California Agricultural Experiment Station from July 1, 1929, to June 30, 1930.—114 pp., 1 pl., 2 figs., 1931.

Many of the items of phytopathological interest in this report, which is compiled on the usual lines [*R.A.M.*, ix, p. 766], have

already been noticed from other sources, but the following may be mentioned. Ceresan was found to be less effective than copper carbonate in the control of wheat bunt [*Tilletia caries*].

Resistance to curly top of beets [ibid., ix, p. 758] has been found to be an inherent characteristic of many individual plants. In the case of the P–19 strain a consistent transmission of this character through five successive generations has been observed. When grown under exposure to infection, the P–19 strain gave a higher yield, a higher percentage of surviving beets, and a higher average size of roots than the commercial strain. The defects of this strain are low vigour, low vitality of seed, comparatively low sugar content, and an undesirable shape of root, but experiments are in progress to overcome these drawbacks by cross-pollination with certain strains combining some degree of resistance with other advantages, and promising results have already been obtained.

Evidence was obtained that the causal organism of beet mildew (*Peronospora schachtii*) [ibid., viii, p. 695] is carried in or on the seed.

Globe artichokes [*Cynara scolymus*] in various coastal districts suffered from a disease apparently due to a virus.

Individual bulbs among eight commercial varieties of onions were found to possess a certain degree of resistance to pink-root [*Phoma terrestris*: ibid., ix, p. 155]. A positive correlation was detected between soil infestation and severity of attack by this fungus, to which the Sweet Spanish variety seems to be slightly more resistant than other commercial sorts. Leeks (*Allium porrum*) are somewhat susceptible.

Gram (E.). **Afsvampningsundersøgelser. IV. Udbytteforsøg med Kornarterne.** [Disinfection investigations. IV. Yield experiments with cereal species.]—*Tidsskr. for Planteavl*, xxxvii, 4, pp. 659–674, 1931. [English summary.]

Continuing his experiments in the disinfection of cereal seed-grain in Denmark [*R.A.M.*, viii, p. 710], the writer conducted further tests in 1929 and 1930 to ascertain the additional yield obtained by treatment on eight replicate plots, each trial being made at two experiment stations.

The results of the tests [which are tabulated and discussed] showed that wheat bunt (*Tilletia caries*) in the Standard variety is controllable by the following methods: sprinkling with germisan, tillantin C, sanagran VIII, danatin XI, and dahmit [ibid., xi, p. 117]; semi-dry use of sanagran VIII and dahmit; and dusting with ceresan. Infection in the untreated control plots ranged from 33 to 60 per cent., causing a reduction in the grain yield of 19 to 54 per cent. The average increase of grain resulting from the treatments was 10·7 to 11·3 hectokg. per hect.

The incidence of stem smut of Petkus rye (*Urocystis occulta*) was reduced from between 8 to 15 to 0·5 per cent. or under by the above-mentioned treatments, which largely prevented the reduction of yield due to the disease (13 per cent. loss of grain with 14 per cent. infection).

The fungicides used in these tests were also effective against stripe disease of barley (*Pleospora graminea*); the losses due to

this fungus, however, are generally very slight in Denmark, and they seldom exceed 0·5 to 0·7 per cent. of grain for each per cent. of infection.

Good control of loose smut of oats (*Ustilago avenae*) was given by sprinkling with formalin and by 30 minutes' immersion in 0·25 per cent. sanagran VIII, as well as in 0·5 per cent. dahmit or havre-fusariol (100 gm. corrosive sublimate and 250 gm. 40 per cent. formalin in 100 l. water) [ibid., ix, p. 639]. The increased yield due to these treatments was not appreciable, as the disease has become rare in Denmark.

BURTON (G. J. L.). **Annual Report of the Senior Plant Breeder for 1930.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1930*, pp. 228-243, 1931.

During the period under review considerable damage was caused by the root and foot rot diseases of wheat (*Fusarium* spp.), which had not hitherto been recorded in Kenya [*R.A.M.*, x, p. 513]. Glume blotch [*Septoria nodorum*] and black chaff [*Bacterium translucens* var. *undulosum*: ibid., x, p. 441] also occurred either alone or in conjunction with the *Fusarium* spp. Yellow rust [*Puccinia glumarum*: ibid., x, p. 301] was epidemic throughout the country, extending to below 6,000 ft.; only once before has this organism been found at such comparatively low altitudes. One hundred bags of seed of the yellow rust-resistant Njoro wheats, all of which are also resistant to black rust (*P. graminis*) [ibid., viii, p. 638] should be available for distribution in the coming season. The incidence of infection on these varieties at high altitudes was negligible even during the recent epidemic. Both humidity and temperature play an important part in the reaction of wheat in Kenya to yellow rust; a given variety, for instance, may be resistant at 18° and susceptible at 14°C., while another may be resistant at the latter temperature and susceptible below 10°. Among the progeny from the new crosses made at Njoro in 1931 it is hoped to obtain wheats of varying lengths of maturity resistant to both yellow and black rusts [see above, p. 159]. The black rust-resistant parents used are two of the new Njoro wheats and Kenya Standard, while Equator and a type selected out of Australian Florence are the yellow rust-resistant parents. A large number of wheats have been tested under controlled conditions at the Scott Agricultural Laboratories for resistance to black rust, with the result that, after discarding all those showing an insufficient degree of resistance, many have been retained for multiplication (40 or 50 strains of some families). Some crosses have recently been made with the object of producing early maturing wheat varieties resistant to both black and brown rust [*P. triticina*], and this work has already given promising results.

The root rots of maize due to *Fusarium* spp. and *Gibberella saubinetii* were found to be widespread in the Colony [ibid., xi, p. 39]. *G. saubinetii*, the causal organism of pink ear rot, seems to be specially implicated in the causation of rotting of seed in the ground, and in the dying-off of seedlings from 'blight'. These root rots are considered to be more injurious to maize in the Trans Nzoia than the white blight due to *Helminthosporium turcicum*

[ibid., x, p. 297], progress in the development of varieties resistant to which has been made.

VERWOERD (L.). **Die besmettingsvermoë van die Teleuto-stadium van Puccinia graminis Pers. in Suid-Afrika.** [The infective capacity of the teleuto stage of *Puccinia graminis* in South Africa.]—*Ann. Univ. Stellenbosch*, Ser. A, ix, 2, pp. 8, 1931. [English summary.]

Positive results were obtained, for the first time in South Africa, in the inoculation of the common barberry with teleutospores of the stem rusts of wheat, oats, and rye (*Puccinia graminis tritici, avenae,* and *secalis*). The teleutospores were frozen for 10 to 21 days, and then subjected to alternate wetting and drying every 4 or 5 days for 6 to 8 weeks [cf. *R.A.M.*, x, p. 366]. The inoculation tests were carried out in an incubation chamber, the temperature of which did not exceed 22° C.; 36 to 48 hours later the plants were transferred to the greenhouse. Previous failures are attributed to defective technique, especially as regards the physiological maturation of the teleutospores by artificial methods and the temperature relations at incubation and infection. The adverse effects of high temperatures were apparent in the summer of 1930, when no infection was secured with uredo- or teleutospores of *P. graminis,* whereas uredospores that developed on barley (volunteer) and *Hordeum murinum* in January, 1931, germinated freely and infected the plants.

The dimensions [which are tabulated] of the aecidiospores produced by the teleutospores were as follows: *P. graminis tritici* $19{\cdot}46 \pm 0{\cdot}143$ by $16{\cdot}02 \pm 0{\cdot}014\ \mu$; *P. graminis avenae* $18{\cdot}60 \pm 0{\cdot}084$ by $15{\cdot}75 \pm 0{\cdot}076\ \mu$; *P. graminis secalis* $16{\cdot}87 \pm 0{\cdot}129$ by $13{\cdot}68 \pm 0{\cdot}081\ \mu$. The best infections were obtained with the rust from rye and the poorest with that from oats.

Although these results were obtained under artificial conditions, the necessity of prohibiting barberry importation is evident, since in regions where low winter temperatures prevail, the teleutospores would undergo a natural process of maturation and might well cause the development of the alternate stage.

DE PAOLIS (C.). **Esperienze sopra l'azione che i prodotti di escrezione e del ricambio di 'Pythium' sp. hanno sulla germinazione del Grano.** [Experiments on the action of the excretory and metabolic products of '*Pythium*' sp. upon the germination of Wheat.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 138–143, 1 graph, 1931.

After referring to recent investigations into the effect exercised by certain soil fungi upon the growth of wheat [*R.A.M.*, vi, p. 220; ix, p. 581; x, p. 555] the author gives a detailed account of an experiment to test the effect on wheat of the metabolic products of the *Pythium* which severely attacked wheat near Padua in 1930 [ibid., x, p. 591], five pots each receiving an equal quantity of the filtered culture liquid, boiled ditto, filtered aqueous extract of the mycelium, boiled ditto, and, as a control, the same quantity of water. The same liquids were applied on two subsequent occasions. The pots were sown on 9th May and examined 7, 9, and 12 days later.

Seven days after sowing, pot I showed only about one-seventh as many germinated seeds as pot V (the control), where four seedlings had reached a height of 8 cm., while only one had attained a height of 6 cm. in the first pot. In the first pot the retardation in the germination was very striking, about 80 per cent. of the seed germinating between 16th and 21st May. Pot II showed about one-half as many seedlings as the control; two of them had reached a height of 7·5 cm. and two others of 7 cm. About 35 per cent. of the seed was delayed in germination to between 16th and 21st May. Pot III had about one quarter as many seedlings as the control, with one plant 7 cm. high and three 6 cm. high. About 60 per cent. of the germinations were delayed to between 16th and 21st May. In pot IV 40 per cent. of the seed had not yet germinated. The control pot (V) showed only 3 per cent. failure to germinate; the seedlings were well developed, about 15 of them having attained a height of 6 to 8 c.m. The differences between the plants in the various pots gradually disappeared.

The author concludes that products toxic to wheat accumulated in the culture liquid. These are probably partly excretory and partly obtainable also from the living mycelium. With one or more thermolabile substances, thermostable substances less toxic to wheat are also present. These toxic products retard germination for several days and slow down the rate of growth of the plants in the early stages of their development, thus favouring attacks by the *Pythium* itself as well as by other weak parasites.

TAPKE (V. F.). **Influence of humidity on floral infection of Wheat and Barley by loose smut.**—*Journ. Agric. Res.*, xliii, 6, pp. 503–516, 5 figs., 4 maps, 1931.

The detailed investigation of the relationship of relative atmospheric humidity to floral infection of wheat and barley with loose smut (*Ustilago tritici* and *U. nuda*, respectively) was undertaken following the observation that these smuts rarely occur in the parts of the United States in which relative humidity is low at the time of flowering of these cereals. Preliminary experiments showed that when the flowers of three club wheats (practically immune from loose smut in the eastern provinces) were inoculated with spores under humid conditions, the resulting seed produced from 91 to 96 per cent. smutted plants. In a further series of greenhouse tests, flowers of Little Club wheat inoculated with the smut were exposed for eight days to low (11 to 30 per cent.) and high (58 to 85 per cent.) humidity, with the result that the seed from the former produced 21·90 and that from the latter 93·96 per cent. smutted plants. In the low humidity series, the smut spores in the flowers only started to germinate on the third day from inoculation, and only a few spores with long germ-tubes were found after seven days; in the high humidity series, on the other hand, many spores were in the early stages of germination the day after inoculation, and on the third day about 90 per cent. had produced long germ-tubes. Comparable results were also obtained at Aberdeen, Idaho, where inoculations were made on flowers of Federation wheat and of Moultan and Hanna barleys in the field on desert and on irrigated land, respectively.

The authors consider that these results suggest a practical method for producing stocks of wheat and barley seed-grain free from loose smut by growing them in localities where atmospheric humidity is usually low during the blossoming period.

SIBILIA (C.). **Ricerche sulle ruggini dei cereali. III. La germinazione delle teleutospore di 'Puccinia coronifera', 'P. triticina' e 'P. graminis'.** [Researches on cereal rusts. III. The germination of the teleutospores of *Puccinia coronifera*, *P. triticina*, and *P. graminis*.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 115–128, 4 figs., 2 charts, 1931.

Further investigations [by a method which is described] into the germination of the spores of *Puccinia coronifera* [*P. lolii*], *P. triticina*, and *P. graminis* [*R.A.M.*, x, p. 171] demonstrated that under the climatic conditions that prevail in Italy these rusts germinate after a post-maturation period of about six months, and retain their germinability for about five months, though this period may be prolonged by submitting the teleutospores to artificial stimulation by radiation or immersion in various acids [loc. cit.]. The highest percentage of germination took place from the middle of January to the middle of April; *P. triticina* began and ceased to germinate earlier than *P. lolii* and *P. graminis*. The teleutospores of all three species, but especially those of *P. lolii* and *P. triticina*, readily tolerate high temperature (up to 65° C. for a few minutes) with no appreciable loss of germinative power.

DILLON WESTON (W. A. R.). **The effect of ultra-violet radiation on the urediniospores of some physiologic forms of P. graminis tritici.**—*Scient. Agric.*, xii, 2, pp. 81–87, 1931.

In continuation of his researches on the action of ultra-violet radiation on the viability of fungal spores [*R.A.M.*, x. p. 332], the author briefly describes experiments in which he tested this action on red, greyish-brown, orange, and white selections of uredospores of physiologic form 1 and orange spores of physiologic form 9 of *Puccinia graminis tritici* [ibid., x, p. 169] by exposing them for varying periods of time (from 1 to 90 minutes) to radiations from a 110 volts quartz mercury-vapour lamp. The results [which are presented in tabular form] showed that, generally speaking, the spores were killed more readily when irradiated in water than dry. The lighter coloured (white and orange) selections were more susceptible to the ultra-violet rays than the red and greyish-brown spores, and in parallel experiments, the spores of *Erysiphe graminis* exhibited a susceptibility to the rays comparable to that of the former. The inference drawn from this work is that the pigment in the walls of the darker spores protects the cytoplasm from the injurious action of the ultra-violet rays [cf. also, ibid., x, p. 779].

GASSNER (G.) & STRAIB (W.). **Untersuchungen zur Frage der biologischen Spezialisierung des Weizengelbrostes.** [Investigations on the question of biologic specialization in yellow rust of Wheat.]—*Der Züchter*, iii, 7, pp. 229–240, 2 figs., 1931.

During the period from the beginning of October, 1930, to the

middle of March, 1931, the writers tested 126 German original winter wheat selections for their reaction to 7 strains of yellow rust [*Puccinia glumarum*] and 24 summer wheat selections against 5 strains [*R.A.M.*, x, p. 713]. Subsequently a large number of other varieties were included in the trials, bringing the total to 1,358.

The results of the experiments [which are fully discussed and tabulated] showed that a number of winter wheats, especially of the Dickkopf group, are highly resistant to the Emersleben strain of *P. glumarum*. Of practical significance is the fact that nearly all the selections showing only slight susceptibility to the Schlanstedt I strain of *P. glumarum* are equally resistant to that from Emersleben. The other strains caused severe infection on most of the varieties used in the tests, though Carsten's Dickkopf V showed a fair degree of resistance to all but the Schlanstedt II strain (isolated in October, 1930). Holzapfel's Frühweizen proved highly resistant to the Schlandstedt II, Giessen (Wilhelm), Wetterau, and Hasenberg (July, 1930) strains but succumbed to the Schlanstedt I, Emersleben, Verrières, and Noissy-le-Roi strains. Very similar reactions were shown by the Dutch variety Mansholts van Hoekzomer, which remained, however, immune from the Verrières strain. Both the Weihenstephaner selections remained immune from the Schlanstedt II strain while showing varying degrees of susceptibility to the others. All the summer wheats were severely attacked by the Emersleben strain of yellow rust; Heine's Kolben and v. Rümker's early summer Dickkopf, especially the former, were immune from, or highly resistant to, all the other biologic forms used.

It is pointed out that external factors, especially temperature, exert a profound influence on the reaction of most German standard wheats to the various biotypes of *P. glumarum*, very few being immune under all conditions. Great care must be taken in future investigations on biologic specialization in the rusts to distinguish between the purely systematic aspect of this problem and its practical applications in plant breeding.

GASSNER (G.) & STRAIB (W.). **Die künstliche Rostinfektion von Freilandpflanzen und ihre Bedeutung für den Pflanzenzüchter.** [The artificial rust infection of field plants and its importance to the plant breeder.]—*Der Züchter*, iii, 7, pp. 240–243, 1 fig., 1931.

The writers have found that several weekly applications of spore suspensions of yellow rust [*Puccinia glumarum*: see preceding abstract] are essential to ensure the rapid and uniform distribution of the disease in the field when testing wheats for their resistance to the disease. For large plots a Holder battery should be used for spraying on the spores. The spores should be suspended in a 0·1 per cent. agar solution in preference to water, as this assists adhesion to the leaves. The applications are best carried out in quiet weather during the late afternoon, so that the spores may germinate in the dew of the following night. Satisfactory results have also been obtained by setting rusted plants in the plots at the rate of 10 per sq. m. It has often been found

advisable to inoculate highly susceptible varieties immediately adjoining the test selections rather than the latter themselves; infection then spreads rapidly and uniformly among the plots under observation. Among the winter wheats particularly suitable for this purpose may be mentioned Michigan Bronze, Gold Coin, Michigan Amber, Hopetown, Buffum, and Minhardi, while highly susceptible summer varieties are Oregon, Vehanti, Rosafé, and four varieties introduced from South America by the first-named writer, viz., Chacra II, Universal II, Fideos, and San Martin. The inoculation experiments should be conducted with that particular biologic form of the rust which predominates in the locality.

These methods have also been successfully applied during the last few years to the black and brown rusts of wheat [*P. graminis* and *P. triticina*], crown rust of oats [*P. lolii*], and dwarf rust of rye [*P. anomala*]. It should be noted, however, that autumn and early spring inoculations with *P. graminis* are ineffectual, the best results with this rust being secured in the early summer.

De Paolis (C.). **Esperienze sul trattamento del Grano con anticrittogamici a base di sali di mercurio.** [Experiments on the treatment of Wheat with fungicides containing a basis of mercury salts.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 158–164, 1931.

When wheat seedlings were grown in germinators, pots, and in the field from seed treated with 0·25 per cent. uspulun solution, 0·2 per cent. abavit B solution, the same fungicides used dry, mercuric chloride solution 1 in 1,000, and distilled water of neutral P_H value and tests made for the presence of mercury [cf. *R.A.M.*, x, p. 256; see also ibid., viii, p. 31] by a method [which is described] devised by Petri, it was found that the plants grown in the germinators from the seed treated with mercuric chloride or uspulun solution contained mercury in the roots and stem though its presence in the leaves was doubtful, while those treated with abavit solution had mercury in all three parts. The mercuric chloride markedly reduced the germinative energy and capacity of the seed, this effect being obvious throughout subsequent growth. All the other chemical solutions slightly reduced the germinative energy of the seed, but this effect was almost imperceptible when the uspulun or abavit was used dry.

On the 34th day after sowing the seedlings in pots (50 seeds per pot) the uspulun-treated seed, the mercuric chloride-treated seed, the water-treated seed, the abavit-treated seed, and seed given no treatment measured as a whole, respectively, 796·5, 197, 696·5, 529, and 781 cm. The results of the field tests corresponded with those of the pot tests, the mercuric chloride again giving very poorly developed plants. While the uspulun and abavit did not visibly stimulate growth, the weights of 1,000 seeds from the plants treated with uspulun solution, abavit solution, and distilled water (P_H 7) were, respectively, 36·338, 35·101, and 33·876 gm.

As even dipping the seed in plain water reduced its germinative energy, the author considers that dry seed treatments are always preferable to wet ones.

SCHÜTZ (W.). **Über die Einwirkung von Beizmitteln auf Keimung und Wachstum des Weizens.** [On the influence of disinfectants on the germination and growth of Wheat.]—*Bot. Arch.*, xxxiii, 1–2, pp. 199–256, 1 fig., 26 graphs, 1931. [English summary.]

A comprehensive and fully tabulated account is given of the author's experiments at Hohenheim, Germany, on the influence of various standard fungicides on the germination and growth of winter and summer wheat. The following preparations were used for winter wheat: 40 per cent. formaldehyde (0·1 per cent., 15 or 30 minutes' immersion); copper sulphate (0·5 per cent., 15 to 30 minutes' immersion); copper sulphate (0·5 per cent., sprinkling); germisan (0·125, 0·25, 0·5, and 1 per cent., 30 minutes); urania (Hohenheimer Beize) [*R.A.M.*, v, p. 114], the active principle of which is stated to be mercury rhodanide with a 6 per cent. mercury content (0·125, 0·25, 0·5, and 1 per cent., one hour); uspulun (0·5, 1, 1·5, and 2 per cent., 30 minutes), uspulun-universal (0·125, 0·25, 0·5, and 1 per cent., 30 minutes) [ibid., x, pp. 256, 742]; and abavit B and tillantin dusts, both at the rate of 0·3 gm. per 100 gm. of seed-grain.

In general, the effects of the treatments on the germinative capacity and energy of the seed-grain were favourable, especially where the regulation strengths were used. The beneficial effects were particularly noticeable in the increased development of the root system. This expansion was, however, nearly always accompanied by a reduction of haulm growth, except in the case of urania, which uniformly stimulated the development of both parts.

The summer wheat was treated with 0·25 per cent. solutions of germisan, urania, and uspulun-universal, uspulun (0·5 per cent.), and abavit B and tillantin dusts as above. In the second year of the tests (1928) uspulun-universal was used at a strength of 0·2 per cent. The summer wheat was found to react more strongly to fungicidal treatment than the winter variety (Dickkopf), especially as regards root growth. In a series of tests carried out at a low temperature (6° to 8°, mean 6·5° C.) the stimulatory effect of the fungicides was negligible.

BODINE (E. W.). **Double plate method used for culturing Tilletia levis.**—*Science*, N.S., lxxiv, 1918, p. 341, 1931.

A new procedure has been adopted for obtaining *Tilletia levis* [*T. foetens*] in pure cultures, the essential feature of which is the sowing of the smut spores on 3 per cent. non-nutrient agar in the top of a Petri dish, the bottom of which contains 2 per cent potato dextrose agar. The sporidia of the fungus, when ejected from the sterigmata, fall to the nutrient agar below, where they can be picked off singly or grown into multisporidial cultures free of contamination.

HENRY (A. W.). **Occurrence and sporulation of Helminthosporium sativum P.K.B. in the soil.**—*Canadian Journ. of Res.*, v, 4, pp. 407–413, 1 fig., 1931.

In continuation of his study of the part played by *Helminthosporium sativum* in the foot and root rot of wheat in western

Canada [*R.A.M.*, x, p. 447], the author describes isolation experiments which showed that the spores of the fungus are very rare, if not entirely absent, in field soils. This fact would suggest that if *H. sativum* does live at all in such soils, it must be present largely in the form of mycelium, rendering its persistence there under adverse conditions very precarious. A somewhat expanded account is also given of experiments which showed that when traces of unsterilized soil were introduced into cultures of the fungus on sterilized soil, the sporulation of the organism was entirely suppressed, an effect which is believed to be attributable, in part at least, to the inhibiting action of the normal saprophytic micro-organisms of the soil thus introduced [loc. cit.].

MACINDOE (S. L.). **Stem rust of Oats. Observations at Glen Innes during the 1930–31 season.**—*Agric. Gaz. New South Wales*, xlii, 10, pp. 749–754, 1931.

Stem rust of oats [*Puccinia graminis avenae*] is stated to be of frequent occurrence and considerable severity in the cooler tableland districts of New South Wales; in 1930-1, in particular, climatic conditions at Glen Innes were very favourable to the rapid spread of this rust, a fact which allowed useful observations to be made on the relative resistance of a wide range of oat varieties to the disease, of which three of the five known Australian physiological forms, namely, forms 1, 2, and 7 [*R.A.M.*, ix, p. 439] were present. No variety was entirely free from the rust, but Birdwood (a local cross between Sunrise and Reid), Burke (a local selection from the American Kherson), Early Kherson, Iogold, Laggan, Richland, and Wisconsin Pedigree No. 7 were apparently extremely resistant. Thirteen further varieties [which are listed] exhibited light to moderate infection, while on the other side of the scale 77 varieties were extremely heavily infected; it is pointed out that this last group included such varieties as Red Rustproof and Rustless which are claimed by their producers to be resistant.

The paper terminates with a brief discussion of the problem of breeding oats for resistance to stem rust.

MAINS (E. B.). **Inheritance of resistance to rust, Puccinia sorghi, in Maize.**—*Journ. Agric. Res.*, xliii, 5, pp. 419–430, 4 figs., 1931.

This is a brief report of the work done since 1924 at La Fayette, Indiana, in the study of the inheritance to rust (*Puccinia sorghi*) [*P. maydis*] in pure lines of maize, a summarized account of the earlier results of which has already been noticed from another source [*R.A.M.*, vii, p. 440]. In addition to the resistant selections from Golden Glow 208–R, others resistant to forms 1 and 3 of the rust were obtained from Golden Glow 202–R. All the selections, however, were susceptible to form 4.

PEARSON (NORMA L.). **Parasitism of Gibberella saubinetii on Corn seedlings.**—*Journ. Agric. Res.*, xliii, 7, pp. 569–596, 10 figs., 1931.

This is a detailed and fully illustrated account of the author's study of the parasitism of *Gibberella saubinetii* [*R.A.M.*, x, p. 724]

on young seedlings of three inbred lines of maize, two of which are susceptible and the third is fairly resistant to the fungus. The results indicated that *G. saubinetii* usually enters the host tissues through the wounds in the cortex resulting from the emergence of adventitious roots or from the pulling apart of the epidermal cells in consequence of rapid growth. At first the fungus develops intercellularly, and though at a later stage the cells are invaded, the intercellular progress of the fungus usually continues two or three cells in advance of its intracellular growth. The cell wall is penetrated by a slender filament, and there was some indication that a chemical action is exerted by the fungus at the point of penetration. The unruptured coleorhiza is usually penetrated at points of its apical portion where plug-like structures are normally formed by the deposition of material between the epidermal cells, this material being apparently easily dissolved by the fungus.

Invasion of the host tissue is accompanied by an accumulation of dark-staining material in the cell-walls and intercellular spaces, extending considerably beyond the limits of the fungal advance. It is believed that this material may result from the action of enzymes secreted by the parasite either upon pectin-like substances and pentosans normally present in the cell walls or upon similar substances secreted into these regions by the cytoplasm. In areas extensively invaded by the fungus, the dark-staining material is somewhat decreased in quantity, being possibly used as food by the parasite. Occasionally, a swelling of the cell walls was also observed, especially in cells near the endodermis and in the hypodermal layers, and in the same regions callosities frequently form which may prevent penetration. In semi-resistant strains of maize the endodermis may form a partial, though not complete, barrier against the further penetration of the fungus.

Finally, in the cells bordering *G. saubinetii* lesions and natural or experimental wounds in the cortex of the mesocotyl, a displacement of the nucleus was observed towards the side of the cell nearest to the lesion, as well as alteration in the distribution and amount of the stainable portion of the cytoplasm.

MACKIE (W. W.). **A new disease of Maize and Beans.**—Abs. in *Phytopath.*, xxi, 10, pp. 996, 1931.

A new disease of maize and beans [*Phaseolus vulgaris*] caused by *Rhizoctonia bataticola* [*Macrophomina phaseoli*: *R.A.M.*, ix, pp. 82, 238; xi, p. 104], was observed in California during the summer of 1929. The fungus is readily recognizable by its dense, black sclerotia, 120 to 200 μ in diameter. In culture media about six days are required for the production of the sclerotia. They are found in the bean and maize roots and in the stems up to 10 or 12 inches above soil level; in both hosts they cluster about the vascular bundles and also occur in the pith. Wilt and premature ripening ensue, with a reduction in the size of the plant and the seed. All commercial bean varieties, except large Limas [? *P. lunatus*], and all subspecies of maize were attacked, but some indications of varietal resistance were noticed.

REICHERT (I.) & HELLINGER (E[STHER]). **Citrus fruit diseases newly recorded in Palestine.**—*Hadar*, iv, 12, pp. 276–278, 3 figs., 1931.

During the season of 1930–1, a series of experiments in the control of citrus fruit rots, involving a thorough examination of over 31,700 fruits before and after six weeks' storage, revealed a number of diseases new to Palestine. *Dothiorella ribis* [*R.A.M.*, iv, p. 614; ix, p. 106] is responsible for a rot almost indistinguishable from that caused by *Diplodia* [*natalensis*], and in cultures on nutrient agar the mycelial growth of the two fungi is also similar, turning from dirty white to grey and eventually fumaceous to black. The pycnidia of *Dothiorella ribis* contain hyaline pycnospores measuring 12 to 20 by 3·5 to 6 μ (average 16 to 5 μ), while the ascospores of the perfect stage [*Botryosphaeria ribis*: ibid., iv, p. 178] were 15 to 19 by 5 to 8 μ. Inoculations on wounded and unwounded lemons resulted in the development of the rot within four days at 25° C. The decay originated as a watery yellow spot that changed to a colour between drab and light greyish-olive (Ridgway); later, parts of the fruit turned black. Infection progressed most rapidly along the central core to the stylar end and along the inner albedo and septa. This is stated to be the first record of *Dothiorella* rot on citrus fruits in a Mediterranean country, though Prof. Fawcett informed the writers that the fungus causes a gummosis of the branches in Italy, as well as in California. The disease does not appear to be common in Palestine, but control measures, where necessary, should be similar to those used against *Diplodia* [ibid., ix, p. 777].

A minor stem-end rot of oranges and lemons was caused by *Phomopsis* [(?) *citri*: ibid., x, p. 777], the early symptoms of which are similar to those of *D. natalensis*, except that the smell of the former organism is sweetish and not unpleasant, while that of the latter is irritating and pungent. Oranges attacked by *Phomopsis* develop a pliable, leathery, reddish-brown rot, generally proceeding from the stem-end; in lemons the decay is chocolate-brown, with a strong odour. The rot progresses most rapidly along the inner albedo, the central core, and the membranes of the pulp segments; where the joined septa meet the albedo, the decayed area is reddish-brown. Careful pruning and removal of dead wood, as in the case of trees infected by *D. natalensis*, should also prove beneficial against the *Phomopsis*.

The rot caused by *Sclerotinia sclerotiorum*, also observed for the first time on orange fruit in Palestine during 1930–1 [ibid., x, pp. 118, 307], originates as an orange-brown, firm, leathery spot with an indefinite, watery margin which rapidly advances until the whole fruit is involved. Masses of the white, matted, woolly mycelium formed on the surface of the fruit develop into black, hard, irregularly shaped sclerotia measuring from about 0·5 to several centimetres. Infection spreads rapidly by contact from one fruit to another. The fungus is thought to have been recently introduced into the citrus belt; it has a wide range of hosts in Palestine and may cause serious damage if not kept in check. Although infection takes place in the grove, the symptoms first appear during storage. Diseased fruits in the packing-house should

at once be removed and deeply buried or destroyed, the same treatment being also applied to cover crops or bananas grown in the same grove, from which infection is readily transmissible to citrus by various agents.

Fly speck (*Leptothyrium pomi*) [ibid., x, p. 24] causes no actual harm to the fruits but impairs their clean appearance.

PETRI (L.). **Variegatura infettiva delle foglie di 'Citrus vulgaris' Risso.** [Infectious mottling of the leaves of *Citrus vulgaris* Risso.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 105–114, 1 col. pl., 3 figs., 1931.

An account [illustrated by a useful coloured plate] is given of a marble-like mottling of the young leaves of bitter orange (*Citrus vulgaris* Bisso) [*C. bigaradia* or *C. aurantium*] observed in a grove near Messina, Sicily, in 1930. and in neighbouring groves a year later. The leaves were marked by white, pale green, or yellow irregular areas. In some leaves, especially near the apex of the leaf, the discoloured area extended across the blade, leaving narrow green bands along the midrib and the base of the secondary veins. In asymmetrical leaves only the less developed half showed the condition; these leaves were blistered and wilted.

Isolated leaves did not show the mottling, all the leaves on a twig or on several twigs being affected. Sweet orange [*C. sinensis*], lemon, and mandarin [*C. nobilis* var. *deliciosa*] remained unaffected, although the last two were in close proximity to affected sour oranges. Nearly all the mottled leaves were attacked by the black citrus aphid, *Toxoptera aurantii*.

Sections of affected leaves showed that the epidermal cells were normal, but the two-layered palisade consisted of shorter cells than those present in the green parts, and in these short cells the chloroplasts were poor in chlorophyll, the yellow areas being due to this deficiency; where the leaf was white the whole cytoplasm and the nucleus of the palisade cells had undergone a gummy degeneration. The spongy tissue underwent a similar degeneration, but only partially, and only the cells contiguous to the white palisade showed a clot of gum in the centre of the cellular cavity, while chloroplasts were present at the periphery. At scattered places in the leaf blade there was hypertrophy of the epidermal cells and hyperplasia of the underlying palisade, the cells of which were small and irregularly shaped, and only in a few was the nucleus recognizable. This increase in the palisade cells causes the upper surface of the leaf to protrude slightly, the area thus affected being of a bright malachite green. Excepting for *T. aurantii* the affected leaves show no signs of the presence of injurious organisms.

The author considers that the progressive spread of the disease indicates that it is infectious; the insect vector is probably *T. aurantii*. Further investigations into the etiology of the mottling are in progress.

RABINOVITZ-SERENI (D.). **Sulla presenza degli stomi sull' epidermide della pagina superiore delle foglie di varie specie dei 'Citrus'.** [On the presence of stomata on the upper

surface of the leaves of different *Citrus* species.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 164–170, 1 fig., 1931.

After referring to Petri's recent studies on the mode of infection of citrus by *Deuterophoma tracheiphila* [*R.A.M.*, x, p. 725] the author states that he has ascertained that the midrib of the upper surface of the leaves of lemon, grapefruit, sweet orange, mandarin, and bitter orange is covered with stomata along its entire length; they are fewest at the apex and gradually become more numerous as the base is approached. Lemon leaves average 90, grapefruit 55, sweet orange 49, mandarin 45, and bitter orange 32 stomata per sq. mm.

As the highly susceptible bitter orange has relatively few stomata on the leaf, the author considers that their number and size bear no relation to the susceptibility or resistance of the host to *D. tracheiphila*, which probably results from the chemical properties of the tissues.

RABINOVITZ-SERENI (D.). **Perdita della facoltà germinativa delle spore di 'Deuterophoma tracheiphila' alla fine del periodo primaverile.** [Loss of the germinative capacity by the spores of *Deuterophoma tracheiphila* at the end of spring.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 154–157, 1931.

In studies (in hanging drop cultures) of the effect of various metallic salts and organic compounds upon the pycnospores of *Deuterophoma tracheiphila* [*R.A.M.*, x, p. 725] taken from subepidermal pycnidia on the young branches of bitter orange [see preceding abstracts] near Messina, the author observed that whereas in 0·1 per cent. solutions of potassium iodide and lead acetate the pycnospores became swollen and the number of them which germinated, as well as the length of the germ-tubes, was hardly less than in the controls, in those of other metallic salts such as copper sulphate, aluminium sulphate, and zinc sulphate, the spores scarcely swelled and germination was completely prevented. In cultures in organic compounds such as amygdalin, arbutin, salicin, methyl salicylate, and 1 per cent. gallic acid the number of spores that germinated and the length of the germ-tubes were invariably less than in the controls. In salicin and methyl salicylate the spores germinated rather more readily than in the other organic compounds.

During the experiments the air temperature was at first 18° to 20° C.: at this temperature the spores kept in distilled water for 30 hours all swelled, and 80 per cent. of them germinated, the germ-tubes attaining a length of 300 to 350 μ. When, however, the temperature abruptly rose to 30° only 10 per cent. of the spores swelled and very few germinated, the germ-tubes not exceeding 100 μ in length.

When kept at 15° to 16° for 30 hours none of the spores became swollen, while after 48 hours a few swelled slightly but none showed any sign of germinating; after 72 hours, two or three germinated.

These observations confirm those of Petri to the effect that during the Italian summer the pycnospores of *D. tracheiphila* not merely

become arrested in their development but also completely lose their germinative capacity [ibid., x, p. 593].

RABINOVITZ-SERENI (D.). **Azione stimolante del biossido di carbonio sulla germinazione delle spore di 'Deuterophoma tracheiphila'.** [Stimulation of the germination of the spores of *Deuterophoma tracheiphila* by carbon dioxide.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 143–152, 3 graphs, 1931.

Exposure of the pycnospores of *Deuterophoma tracheiphila,* the cause of the 'mal secco' disease of citrus [see preceding abstracts], in hanging drop cultures to carbon dioxide for 30 hours [by a method which is described] markedly stimulated germination [cf. *R.A.M.*, vi, p. 413; viii, p. 163; x, p. 726], while the proportion of pycnospores which germinated when so exposed was invariably higher than among pycnospores on the same media in a normal atmosphere. The germ-tubes of the pycnospores so exposed showed a more vigorous development, and their average length was greater than in the controls.

RUGGIERI (G.). **Sulla presunta influenza di certi terreni nel rendere resistanti al 'mal secco' le piante di Limone.** [On the presumed influence of certain soils in rendering Lemons resistant to 'mal secco'.]—*Boll. R. Staz. Pat. Veg.,* N.S., xi, 2, pp. 170–171, 1931.

To test whether the absence of mal secco disease of lemons (*Deuterophoma tracheiphila*) [see preceding abstracts] from orchards on clay soil in the Alcantara valley [north-eastern Sicily] was due to the constitution of the soil inducing resistance or merely to the absence of the spores of the organism from this locality, the author grew bitter orange [*Citrus bigaradia* or *C. aurantium*] seedlings in pots of soil from this area (containing over 40 per cent. clay) the experiment being conducted in an infected area near Messina. The following spring the plants developed the disease contemporaneously with its first appearance in the Alcantara valley itself on soils ranging from sandy to muddy.

PASSMORE (F. R.). **Depreciation of prepared Copra due to moulds and insects.**—*Bull. Imper. Inst.*, xxix, 2, pp. 171–180, 1931.

In nearly all samples of copra examined in the course of investigations at the Stored Products Research Laboratories of the Imperial College of Science and Technology, London, some depreciation has been found to be caused by insects and moulds, the losses, however, seldom being sufficiently extensive to warrant biological investigation. Cases of inferior quality are almost always traceable to causes in the country of origin. The following moulds were isolated during a year's inspection of copra samples from widely different sources [cf. *R.A.M.*, x, p. 309]: *Aspergillus niger*, *A. flavus*, *A. tamarii*, *A. chevalieri* [ibid., ix, p. 177], *Rhizopus nigricans*, *Scopulariopsis* sp., *Syncephalastrum* (?) *cinereum*, *Penicillium candido-fulvum* Dierckx and other species of this genus, and *Mucor racemosus*.

Horgan (E. S.). **The value of serological tests for the identification of Pseudomonas malvacearum.**—*Journ. of Bact.*, xxii, 4, pp. 287–293, 1931.

In connexion with an investigation on the epidemiology of black arm of cotton under field conditions [*R.A.M.*, x, p. 661], a serological study was carried out with various strains of *Pseudomonas* [*Bacterium*] *malvacearum* to determine the specificity of the agglutination test in the identification of this organism. Most of the strains were isolated from various sources in the Sudan and conformed in all cultural and morphological characters to the standard description of *Bact. malvacearum*. Great difficulty was experienced in many cases in the isolation of *Bact. malvacearum* on potato agar slopes, owing to the frequent close association with the black arm organism of a Gram-positive bacillus. Several other yellow and non-pigmented organisms of the *Pseudomonas* group are found in conjunction with *Bact. malvacearum* in the plant lesions, and four of these were isolated to ascertain their serological connexion with the black arm pathogen. Antisera were readily prepared by giving rabbits three or four weekly intravenous inoculations of a fairly thick suspension of the organism to be tested. Agglutination was carried out by the macroscopic method, the tubes being left for six hours in a water bath at 52° C. and then on the bench for 24 hours.

The results of the tests [which are tabulated and briefly discussed] showed that both floccular and granular or somatic agglutinins were present in all the sera prepared against four strains of *Bact. malvacearum*. The so-called 'rough' strain X5 (from Shambat lint) gave a perfect emulsion without a trace of the 'R' agglutinin, but a tendency to the formation of granular colonies was observed. Absorption was found to be completely reciprocal, any one strain removing all agglutinins from a given serum, both for itself and for all other strains. There would appear to be entire antigenic identity of all the Sudan and Egyptian strains of *Bact. malvacearum*, while a Trinidad strain also gave exactly similar agglutinin reactions. On the other hand, the E.F.S. strain of *Bact. malvacearum* gave anomalous results, indicating either a certain difference from the Sudan ones or an antigenic alteration as the result of repeated subculturing. No kind of antigenic relation was found to exist between *Bact. malvacearum* and the yellow pigmented organisms isolated from green bolls, or between the black arm pathogen and *P. hyacinthi*, a strain of *P. campestris* from Paine, and *Bacillus amylovorus*. On the other hand, some degree of cross-agglutination was observed between *Bact. malvacearum* and *P. campestris* E.F.S. strain [cf. ibid., vi, p. 651].

Ezekiel (W. N.), Neal (D. C.), Dawson (P. R.), & Reynolds (E. B.). **Report of the fourth annual Cotton-root-rot conference.**—*Phytopath.*, xxi, 10, pp. 957–964, 1931.

Among other items of interest in this report on *Phymatotrichum omnivorum* in relation to cotton root rot the following may be mentioned [cf. *R.A.M.*, x, p. 241]. Physiologic forms differing widely in cultural characters were described by the first-named author and J. J. Taubenhaus. On potato-dextrose agar and

synthetic media, the strains provisionally assigned to form 1 produce an abundant buff-coloured growth and sclerotia, while those on form 4 develop more sparsely, remain white, and produce no sclerotia. Forms 2 and 3 possess intermediate characteristics.

S. E. Wolff and B. F. Dana reported as additions to the host list of *P. omnivorum* 32 non-cultivated and 35 ornamental species and varieties. Ezekiel and Taubenhaus stated that the guayule rubber plant (*Parthenium argentatum*) is susceptible to root rot. W. J. Bach found that the Champanel, Mustang, Black Spanish, and *Vitis chatini* grapes retained their resistance to root rot previously reported, the Dog Ridge, *V. salonis*, *V. constancia*, and *V berlandieri* varieties being also resistant. A high degree of resistance is still maintained by the sour orange [*Citrus aurantium*] rootstock for citrus. In tests of cover crops for use in citrus groves, *Crotalaria spectabilis*, *C. striata*, and cowpeas proved very susceptible, while *C. incana* and *Sesbania* were moderately resistant.

Notes are given on the toxicity to *P. omnivorum* of various disinfectants.

NEAL (D. C.) & McLEAN (L. G.). **Viability of strand hyphae of the Cotton root-rot fungus.**—*Journ. Agric. Res.*, xliii, 6, pp. 499–502, 1 fig., 1931.

In continuation of the study of the mode of hibernation of the cotton root rot fungus (*Phymatotrichum omnivorum*) in Texas [*R.A.M.*, x, p. 186 and next abstracts], the authors state that the rhizomorphic mycelial strands of the organism, permeating the soil mass under spore mats collected from an active zone of infection in a lucerne field, proved to be viable after desiccation in the air at ordinary room temperature for six and a half months; the conidia on the mats failed, however, to germinate after that time. Further experiments showed that strands of the fungus at various depths in the soil of infected cotton fields were viable as late in the season as 10th December, but excavations during the three subsequent months failed to reveal any of these strands, a fact which tends to show that the organism does not overwinter in cotton fields in this form. The inference, therefore, is that the sclerotial stage is the main source of the perpetuation of the organism from year to year.

NEAL (D. C.) & RATLIFFE (G. T.). **Infection experiments with the Cotton root-rot fungus, Phymatotrichum omnivorum.**—*Journ. Agric. Res.*, xliii, 8, pp. 681–691, 3 figs., 1931.

Details are given of greenhouse and field experiments in 1928 and 1929 at San Antonio and Greenville, Texas, in the study of the pathogenicity to cotton of *Phymatotrichum omnivorum* [*R.A.M.*, x, p. 789, and preceding extracts], in which cotton plants of various ages were inoculated with pure cultures of the fungus grown from sclerotia found in the soil, sclerotia found in laboratory cultures [ibid., x, p. 662], and conidial mats. Successful infection of the plants was obtained and in some cases caused the death of the host. In pot experiments great variations were observed

in the minimum time required for initial infection. In field inoculations with infected roots there was some indication that the fungus was most virulent when on freshly infected roots, bearing a fine white mycelium. Attempts to transfer the disease to new areas by means of soil taken from a zone of active infection gave negative results, but it is pointed out that this failure may have been due to the dryness of the 1929 season, and possibly also to the fact that sclerotia were not present.

FAHMY (T.). **The genetics of resistance to the wilt disease of Cotton and its importance in selection.**—*Min. of Agric., Egypt, Tech. & Sci. Service (Plant Protect. Sect.) Bull.* 95, 30 pp., 10 pl., 13 graphs, 2 charts, 1931.

As regards their reaction to wilt disease (*Fusarium vasinfectum* var. *aegyptiacum*) [*R.A.M.*, x, p. 379], the cotton varieties grown in Egypt may be divided into two main groups, viz., immune (mainly Ashmouni types, grown chiefly in Upper Egypt), and non-immune, e.g., Sakel, cultivated exclusively in Lower Egypt. The results [which are tabulated] of greenhouse tests showed that susceptibility in the Sakel types ranges from 5·9 to 94·2 per cent., the corresponding figures for St. Kitts, St. Vincent, and Pima 5/28 being 94·5, 73·4, and 100 per cent., respectively. A number of American varieties proved immune from wilt in Egypt, including Dixie Triumph, Webber, Express 95, Toole, Cleveland, Lightning Express, and Mexican Big Boll, as also did the Indian *Gossypium hirsutum* var. Nauk., Dharwar II No. 1, Buri No. 3, Codag 1, and Jayawant.

Susceptibility to wilt is an inherited character. In the F_2 generation of genotypic immune and susceptible parents segregation occurs, giving three types: immune (75 per cent.), resistant (15 per cent.), and susceptible (10 per cent.). The immunes may breed true or segregate. In the resistant group segregation occurs, giving either two (immune and resistant) or all three types. It was not possible to follow the susceptible group in the progenies of the above-mentioned cross, since all died at the seedling stage, but in the case of Domains Sakel plants reviving after 'partial' death in the infected field, segregation may take place in the progenies notwithstanding typical symptoms of wilt in the mother plant. It is evident that the immune parent in a susceptible-immune cross can transmit an element of resistance to some of its susceptible progeny which becomes manifest in the F_2 generation by an increase in the length of the incubation period of the fungus. The same thing occurs in a heterozygous susceptible cross. This resistance to invasion on the part of the host is important, since plants with a long incubation period yield a higher percentage of immune progenies than those which rapidly succumb to infection.

No complete correlation was found between length of staple in Domains Sakel and susceptibility. Plants with short staple lint may produce offspring of equal susceptibility with those raised from long staple parents. Resistant plants, as a whole, are of lower lint quality, but may include a few individuals of fair staple length that might prove useful in the further selection of immune

types. More satisfactory results may be secured in a shorter time, however, by testing the susceptibility of related families already selected for lint quality independent of reaction to wilt, and subsequently isolating a desirable type immune from wilt and of superior quality. In this connexion a brief account is given of two promising selections, Sakha 4 and Myco 5.

PETCH (T.). **Notes on entomogenous fungi.**—*Trans. Brit. Mycol. Soc.*, xvi, 1, pp. 55–75, 4 figs., 1931.

In this paper the author gives taxonomic notes [including diagnoses in English of one new genus (*Ophiocordyceps*) and several new species] on the following entomogenous fungi: *Beauveria laxa* n.sp. on larvae of a lepidopteron, of *Tortrix* sp., of the coco-nut moth *Brachartona catoxantha* [type specimen of *Botrytis necans* Massee: *R.A.M.*, iii, p. 569], and on spiders, lepidopterous cocoons, and tineid cases; *Beauveria bassiana* on caterpillars, beetles, *Astycus* sp., *Cyclopeltella siccifolia*, centipedes, millipedes, the larvae of a longicorn, and *Haplocerambyx spinicornis*; *B. densa* on a leafhopper, various beetles, and lepidopterous cocoons; *Rhinotrichum album*, which has recently been found to be the same as *Gonatorrhodiella coccorum* [ibid., v, p. 97], on *Lecanium*, *Aleyrodes*, aphids, and leaf-hoppers; *Volutella epicoccum* [ibid., vi, p. 552] on scale insects on *Cinnamomum ovalifolium*; *Hypocrella schizostachyi* on *Lecanium bambusicola*; *Isaria abietina* (which is renamed *Hirsutella abietina* comb. nov.) on a sugar-cane hopper (*Pyrilla pusana*); *Oospora insectorum* n.sp. on a spider, (?) *Aleyrodes*, and various pupae; *O. subfasciculata* n.sp. on a millipede and on a pupa; *Tilachlidium larvarum* on the larvae of a micro-lepidopteron; *Acremonium griseum* on spiders, a fly (*Mydaea* sp.), and a lepidopterous cocoon; *Botrytis eriophyes*, which is now renamed *Cephalosporium* (*Acrostalagmus*) *eriophytis*, on *Eriophyes ribis*; *Isaria cicadae* on locusts; *Metarrhizium anisopliae*, the green muscardine fungus [ibid., ix, p. 717], on various insects; *M. album* n.sp. on *Tettigoniella spectra* on rice; *Cephalosporium* (*Acrostalagmus*) *aphidicola* n.sp. on aphids; *C. crassum* n.sp. on *Pentalonia nigronervosa*; *Sterigmatocystis ferruginea* on the pupa of *Attacus ricini*; *S. fulva* on the silkworm (*Bombyx mori*); *Penicillium brevicaule* on dead insects; and *Cordyceps sherringii* Massee on an ant (considered to be an immature *C. lloydii*).

Four species of *Cordyceps*, namely, *C. blattae*, *C. unilateralis*, *C. peltata*, and *C. rhizoidea* are grouped into a new genus, *Ophiocordyceps*, and are renamed *O. blattae*, *O. unilateralis*, *O. peltata*, and *O. rhizoidea*, with the first named as the type species. *Beauveria peteloti* Vincens is stated to consist of a *Sporotrichum* growing on the clavae of *Hirsutella saussurei*.

TOUMANOFF (C.). **Action des champignons entomophytes sur les abeilles.** [The action of entomogenous fungi on bees.]—*Ann. de Parasitol. Humaine et Comp.*, ix, 5, pp. 462–482, 6 graphs, 1931.

After a brief review of the results obtained by previous investigators in the experimental infection of bees with entomogenous fungi [*R.A.M.*, iii, p. 336; ix, p. 591], the author gives details of

his own work with *Aspergillus flavus, Isaria farinosa*, and *Beauveria bassiana.* Of these organisms *A. flavus* alone proved to be constantly and highly virulent to the bees, killing the experimental populations within five days, while control insects under similar conditions lived over a fortnight. High individual resistance to the fungus was, however, observed among the bees, and generalized mycosis caused by it was only observed in two cases, the infection in the still living insect being usually localized to the digestive tract. It is stated that generalized infection caused by *A. flavus*, as seen in the two exceptional cases, had not been previously recorded in the bee. *I. farinosa* and *B. bassiana* were weakly and only occasionally pathogenic. Attempts to infect the larvae by inoculating the cells of the honeycombs with spore suspensions of all the three fungi have so far consistently given negative results.

The investigation also indicated that the lethal action of the organism on the bees is almost exclusively due to the toxins secreted by them or liberated by the action of the gastric juices on the mycelium, a suggestion which is confirmed by the fact that culture filtrates of *A. flavus* and *B. bassiana* were very toxic to the bees fed upon them; the symptoms brought about by this means or by experimental infection were similar to those observed in insects suffering from naturally contracted parasitic diseases.

SIGOT (A.). **Une Chytridiacée nouvelle, parasite des œufs de Cyclops: Blastulidiopsis chattoni n.g., n.sp.** [A new Chytridiaceae, parasitic on *Cyclops* eggs: *Blastulidiopsis chattoni* n.g., n.sp.]—*Comptes rendus Soc. de Biol.*, cviii, 27, pp. 34–37, 1 fig., 1931.

In 1929 and 1930 *Cyclops* eggs laid in a pond in the garden of the Strasburg Institute of Zoology and General Biology were found to be infected by a parasite causing protuberances and general enlargement. Stained sections of infected eggs appeared to contain circular or elliptical blastules of variable dimensions, the wall of which enclosed a large number of regularly distributed nuclei furnished with a caryosome. In reality, however, these pseudoblastules are connected and merely constitute swellings or diverticula of a single cavity. At maturity a large number of biflagellate zoospores are discharged. The flagella are inserted laterally into the zoospores, one moving forwards and the other backwards; they are unusually long (15 to 20 μ), the length of the spore being only 6 to 8 μ.

On encountering a healthy egg, the zoospore adheres to the surface, discards its flagella, and penetrates the egg by means of a kind of mycelial tube. The nuclei multiply and divide, while the mycelial hypha increases in diameter, branches, swells in places, and forms vacuoles which expand, converge, extend into the ramifications of the plasmodium, and ultimately constitute the cavity of the large circumvolute chamber. Sporulation occurs when the parasite has completely exhausted the protoplasm of the egg and filled the space enclosed by the ovular membrane. The period of development of the parasite in the egg, from the entry of the zoospore to sporulation, corresponds approximately to that of

the *Cyclops* egg. The regular recurrence of the parasite in the spring (end of February and March) implies the existence of resting forms and probably of heterothallism.

The organism is referred to the Chytridiaceae under the name of *Blastulidiopsis chattoni* n.g., n.sp., its analogies with other genera of this family being briefly discussed.

MACY (H.), COMBS (W. B.), & MORRISON (H. B.). **The churn as a source of molds in butter.**—*Journ. Dairy Sci.*, xiv, 5, pp. 398–403, 1931.

Two churns from commercial creameries in Minnesota were examined for the presence of moulds, which were most abundant in one that had given considerable trouble as a source of mouldy butter. Moulds of the following genera occurred in both: *Mucor*, *Penicillium*, *Aspergillus*, *Alternaria*, and *Hormodendrum*, while the more contaminated one also contained species of *Monilia*, *Sporotrichum*, *Acremoniella*, *Botrytis*, *Phoma*, *Spicaria*, *Gliocladium*, *Oospora*, *Spondylocladium*, *Cephalosporium*, *Chaetomium*, *Sordaria*, and *Tilachlidium* [cf. *R.A.M.*, x, p. 242].

MILOCHEVITCH (S.). **Sur un cas de trichophytie produit par une espèce nouvelle de Trichophyton, T. langeroni n. sp.** [On a case of trichophytosis caused by a new species of *Trichophyton*, *T. langeroni* n. sp.]—*Ann. de Parasitol. Humaine et Comp.*, ix, 5, pp. 456–461, 1 pl., 2 figs., 1931.

This is a brief morphological and cultural account of a species of *Trichophyton*, considered to be new to science, which was isolated from a ringworm on the head of a child in Belgrade. The fungus, for which the name *T. langeroni* is suggested, was grown on the whole series of natural and artificial media recommended by Langeron and Milochevitch [*R.A.M.*, x, p. 242], but failed in every case to produce fructifications other than arthrospores and terminal or intercalar chlamydospores. On agar media it formed typical faviform colonies, with all the morphological details characterizing them. The organism is believed to represent a new section, *microides*, of the genus *Trichophyton*, with characters belonging both to the endothrix and megaspore sections. Inoculations into the guinea-pig gave negative results.

GOUZARTCHIK-GLARNER (Mme V.). **Étude biologique d'une souche d'Aspergillus fumigatus isolée des crachats d'un malade.** [A biological study of a strain of *Aspergillus fumigatus* isolated from the sputum of a patient.]—*Comptes rendus Soc. de Biol.*, cviii, 29, pp. 374–376, 1931.

Spore suspensions in physiological serum of *Aspergillus fumigatus*, isolated from sputum of a male patient [*R.A.M.*, x, p. 28], caused severe internal disturbances on inoculation into rabbits and guinea-pigs, the kidneys being chiefly affected while the lungs and liver were also involved. A limited degree of success was achieved in reducing these symptoms by intratracheal injections of the antivirus of *Aspergillus* into the guinea-pigs previous to inoculation.

MARCHAL (E.). **A propos de la 'brûlure' du Lin.** [On 'fire' of Flax.]—2 pp., Pamphlet of Congrès National des Sciences. [Belgium, 1931.]

In the spring of 1930 the author examined flax from the vicinity of Courtrai which showed typical symptoms of 'fire', usually associated with *Asterocystis radicis* and *Pythium megalacanthum* [*R.A.M.*, x, p. 731]; the end of the stem was flaccid, the leaves, especially the lower ones, were yellow, and the main roots showed vitreous ramifications and were easily detached.

An examination of fifty plants showed the constant presence at the base of the root hairs, in the cells of the piliferous layer, and in the underlying parenchyma, of the resting spores of *A. radicis*. Few sporangia were present as the fungus had already ceased very active reproduction. On no plant was *P. megalacanthum* present, and cultures made from the affected roots did not yield this or any other organism that could possibly cause the disease.

On further flax plants affected by fire from three other localities the author also found *A. radicis* but no *P. megalacanthum*. He therefore concludes that in Flanders the disease is associated ordinarily with the former fungus.

BURNETT (L. C.) & REDDY (C. S.). **Seed-treatment and date-of-sowing experiments with six varieties of Flax.**—*Phytopath.*, xxi, 10, pp. 985–989, 1931.

Experiments conducted with the chief flax varieties resistant to wilt [*Fusarium lini*: *R.A.M.*, x, p. 384] at four places in Iowa in 1930 showed that Bison seed of high vitality treated with ceresan (2 oz. per bushel) produced percentage stands of 42·6 to 63·6 compared with 14·9 to 53·4 for untreated seed of the same lot. This preparation increased the yields of Bison flax by 26·5 per cent. in 26 replications, and those of five other varieties, viz., N[orth] D[akota] R[esistant] 114, Redwing, Linota, Buda, and Rio (2 replications each) by percentages ranging from 12·6 to 44·5.

ZAPROMETOFF (N. G.). Болезни новых лубянных культур в Ташкентском районе. [Diseases of new bast-producing cultures in the region of Tashkent.]—*За новое Волокно.* [*In Furtherance of the New Fibre*], Moscow, *1931*, 8–9, pp. 60–65, 1931.

In this preliminary report brief accounts [together with some notes of local interest] are given of the chief parasitic and physiological diseases which were found in 1930 attacking newly introduced fibre- and bast-producing crops in Russian Central Asia, with particular reference to those grown in the district of Tashkent, among which the following may be mentioned.

Kendir fibre (*Apocynum sibiricum*) [*A. venetum*] was severely attacked by rust (*Melampsora apocyni*) [*R.A.M.*, x, p. 435], the incidence of which, in some localities, was over 77 per cent.; the disease was particularly severe on plants left for seed and on young transplants from under glass. This host also suffered heavily from a wilt caused by a species of *Fusarium* which attacks the root system, frequently in association with an undetermined eelworm. On the roots and collar the organism forms a whitish-grey efflorescence, under which the wood tissues are blackened and the cortex rots.

In pure culture on rice and acid agar the fungus produced oblong-oval, occasionally bean-shaped, continuous or two-celled microconidia, 8 to 15 μ long; hyaline, slightly bent, two- or three-septate macroconidia, 16 to 32 μ long; and white, warty sclerotia. The substratum was white at first, later pale purple. In one locality the stems of kendir fibre plants were found to bear slightly sunken, irregular or elongated, brown lesions, bearing black, globose or oval pycnidia (immature), 450 to 500 μ in diameter, of a fungus of the *Phoma* type.

Indian hemp (*Hibiscus cannabinus*) was attacked by powdery mildew (*Leveillula* [*Oidiopsis*] *taurica*) [ibid., ix, p. 715], this being stated to be the first record of the fungus on this host; by *Moniliopsis aderholdi*, which caused a root rot of young seedlings, and by wilt (*Fusarium vasinfectum*), which in 1930 was of no consequence. *Abutilon avicennae* suffered from wilt caused by unidentified, soil-inhabiting species of *Fusarium*, and from sooty mould caused by *Cladosporium herbarum* and *Macrosporium abutilonis* [ibid., vii, p. 763]. In addition to wilt (*F. vasinfectum*) and seedling root rot (*M. aderholdi*) *H. esculentus* was attacked by powdery mildew (*Oidium abelmoschii*) [ibid., vi, p. 321]. Jute (*Corchorus capsularis*) in several localities suffered severely from attacks by *Epicoccum neglectum*, which caused the formation, first on the leaves, and then on the petioles and green portions of the stems, of rounded, polygonal, brown spots with black margins, from 0·25 to 0·75 cm. in diameter.

OCFEMIA (G. O.). **The bunchy-top of Abacá and its control.**—*Philipp. Agric.*, xx, 5, pp. 328–340, 6 figs., 1931.

In this paper the author presents the results so far obtained in his investigations, which have been in progress since 1925 and have been noticed from time to time in this *Review*, on the bunchy top disease of abacá [*Musa textilis*] in the Philippines and its control [*R.A.M.*, xi, p. 46].

DUFRÉNOY (J.). **Mosaïque des Tulipes.** [Tulip mosaic.]—*Comptes rendus Soc. de Biol.*, cviii, 27, pp. 51–53, 2 figs., 1931.

A mosaic affection similar to 'breaking' of tulips in England [*R.A.M.*, x, p. 599] has been observed in France among bulbs imported from Holland. Severely diseased plants are stunted and partially or entirely fail to flower; the leaves are concrescent and show elongated discoloured blotches; and the cytoplasm, hollowed by numerous small vacuoles, presents a spongy aspect and contains an abundance of lipoids near the nucleus. Affected plants die prematurely. Normally the epidermal cells of red flowering varieties are almost entirely filled by a large central vacuole containing a red solution of anthocyanin, while in the mottled areas of diseased flowers some of the small, spherical vacuoles contain this substance and in others the solution is uncoloured.

ZELLER (S. M.) & DEREMIAH (J. W.). **An anthracnose of Ledum caused by a species of Elsinoë.**—*Phytopath.*, xxi, 10, pp. 965–973, 3 figs., 1931.

Particulars are given of an anthracnose of the evergreen shrubs,

Ledum glandulosum and *L. groenlandicum*, in the United States. The leaves develop greyish-white lesions with reddish-brown borders, often surrounded by purplish margins, while the branches, flower pedicels, calyx, and capsules may also be attacked. The causal organism, to which the name *Elsinoë ledi* (Peck) Zeller n. comb., is given (with an English diagnosis), is characterized by solitary or gregarious pulvinate stromata which occur near the centre of the lesion, and are circular or irregular, black, and 45 to 200 μ in diameter. A pseudoparenchymatous ascocarp with a hyaline interior and brownish surface arises beneath and ruptures the ectostroma; it is 70 to 19 μ broad and 28 to 110 μ high. The scattered loculi contain each a single subspherical ascus, 17 to 25 by 21 to 28 μ, with 1 to 8 (mostly 4 or 8) ellipsoid to fusoid, generally unilateral, triseptate (rarely uni- or biseptate) ascospores measuring 12 to 17·7 by 5 to 6·5 μ.

CUNNINGHAM (G. H.). **Fireblight and its control.**—*New Zealand Journ. of Agric.*, xliii, 2, pp. 111–118, 3 figs., 1 map, 1931.

In giving a brief account of the spread and economic importance of fireblight (*Bacillus amylovorus*) of pomaceous trees in New Zealand [*R.A.M.*, ii, p. 273; x, p. 318], the author states that when it first appeared there in 1919, it destroyed in a single season many acres of pear trees, apparently threatening the whole future of the fruit industry. Within a few seasons from the initial outbreak, however, the damage caused by it was reduced to the killing of occasional branches of pear trees and the destruction of a proportion of blossom spurs on apples and pears. The same sequence of events was again repeated when the disease made its first, epidemic appearance in 1927 in the districts of Wanganui, Hawke's Bay, Manawatu, and Wairarapa. At the present time, fireblight is regarded as a serious disease of the pear only in those localities where it has not yet appeared, since under normal conditions in the already infected areas it only takes a small annual toll of blossoms, although occasionally some branches may be killed, and in extreme cases a whole tree may be destroyed. On apple trees the disease seldom does serious damage.

In discussing control measures it is pointed out that the problem, which theoretically could find an easy solution by the elimination from the orchards of hold-over cankers, is complicated by the fact that in some regions the highly susceptible hawthorn [*Crataegus*] is used as a cattle shelter hedge, this rendering the elimination of the fungus a practical impossibility. To meet this difficulty an Act was passed in 1922 [ibid., ii, p. 144] which has made possible the removal of hawthorn hedges in the vicinity of commercial orchards, a step which, in conjunction with the rigorous practice of excising all small cankers and sterilizing larger ones, has led to a practical control of the disease in most commercial fruit-growing areas. The method found most effective is the complete removal of all infected laterals, fruit spurs, or small branches, the cut being made some little distance below the visible point of infection. On larger branches the cankers may be excised to a depth of at least half an inch below the surface, the resulting wound being sterilized by swabbing it with a solution made up of 1 gm. mercuric chloride,

15 c.c. concentrated hydrochloric acid, and 1,000 c.c. water; as soon as the wound has dried up it should be painted with coal-tar and kept under observation for a month or so, when the treatment should be repeated if the cankers show any signs of further spread. [This paper is also printed as *New Zealand Dept. of Agric. Bull.* 153, 1931.]

DULLUM (N.). **Forsøg med Kombination af Svovlkalk- og Bordeaux-vædskesprøjtninger til Æbletræer.** [Experiments with lime-sulphur and Bordeaux mixture sprays on Apple trees.]—*Tidsskr. for Planteavl*, xxxvii, 4, pp. 641–658, 13 figs., 1931. [English summary.]

The following spray schedules were used against apple scab (*Venturia*) [*inaequalis*] at the Danish State Experiment Station during 1929 [cf. *R.A.M.*, ix, p. 113]: (*a*) four applications of Bordeaux mixture ($\frac{1}{2}$ kg. copper sulphate and 1 kg. burnt lime per 100 l. water); (*b*) one application of lime-sulphur (2 kg. lime-sulphur per 100 l. water) followed by three of Bordeaux mixture; (*c*) one of Bordeaux mixture followed by one of lime-sulphur and two of Bordeaux mixture; (*d*) in 1930 two applications of lime-sulphur followed by two of Bordeaux mixture were given instead of Bordeaux mixture only as in (*a*).

In 1929 the percentages of perfectly clean fruit obtained under schedules (*a*), (*b*), and (*c*) were 14·9, 28·8, and 61·4 per cent., respectively, the corresponding figures for spray injury being 19·6, 14·3, and 1·8, respectively. In 1930 the percentages of perfect fruit were as follows: (*b*) 56, (*c*) 53·2, and (*d*) 68·9, the figures for spray injury being 2·7, 0·4, and 0·4, respectively. The fact that spray injury from the (*b*) and (*c*) schedules was more severe in 1929 than in 1930 is attributed to the unfavourable weather conditions (damp and cold) before the second application in the former season. At this critical period the fruit is highly sensitive to spray injury, which may cause considerable damage to certain varieties. In most cases this form of injury may be reduced within reasonable limits by the substitution of lime-sulphur for Bordeaux mixture in the two first summer applications.

BIRMINGHAM (W. A.) & BROADFOOT (H.). **Black spot or scab of Apple. Experiments for its control in New South Wales. Part II. The Batlow experiments.**—*Agric. Gaz. New South Wales*, xlii, 9, pp. 721–729, 5 figs., 1931.

In continuation of the senior author's account of the experiments so far made on the control of black spot or scab [*Venturia inaequalis*] in New South Wales [*R.A.M.*, xi, p. 114], this paper briefly reviews the results obtained in the district of Batlow during the period from 1925 to 1930. Of the seven distinct spray programmes tested during that time, the disease was best controlled by applications of Bordeaux mixture throughout the season, which, however, entail some risks of very severe russeting in certain years. The schedule recommended on the basis of the work, as having reduced black spot infection in the orchards to an average of 1·4 per cent. for the five year period, as against 55·2 to 63·5 per cent. in the controls, without risk of russeting, is 6–4–40 Bordeaux mixture

at the 'burst spur' stage, 1 in 14 lime-sulphur at the 'pink' stage, and 1 in 35 lime-sulphur at the 'calyx' stage and subsequently as required.

FISHER (D. F.) & REEVES (E. L.). **A Cytospora canker of Apple trees.**—*Journ. Agric. Res.*, xliii, 5, pp. 431–438, 5 figs., 1931.

A brief account is given of a serious outbreak in 1928 of cankers on a number of varieties of apple trees at Orondo, Washington, and of an even more severe one in 1929 in British Columbia, caused by apparently the same undetermined species of *Cytospora*. Experiments to test the efficacy of fungicidal dressings applied to the wounds resulting from the surgical treatment of the cankers showed that the best results were obtained with asphaltum paint. A paint prepared from commercial Bordeaux mixture powder and linseed oil (with about 10 per cent. metallic copper content) produced toxic effects on the foliage. Alcoholic solutions of zinc chloride as recommended against pear blight [*Bacillus amylovorus*: *R.A.M.*, ix, p. 792] and a mixture of sodium arsenite and linseed oil produced injurious effects in the wood and bark tissues and in the foliage in every case.

Artificial inoculations with the organism gave negative results on sound apple wood and also on wood injured but not killed by winter frosts. It is believed, therefore, that the fungus is not normally parasitic on apple wood, and that the epidemics observed were due to the weakened, devitalized condition of the trees growing on unsuitable soil, a view which is supported by the fact that improvement in their health brought about by cultural methods and manuring resulted in the cessation of the enlargement of the cankers and in the complete healing of the affected areas.

Control of rust in Peaches.—*Fruit World of Australasia*, xxxii, 8, p. 466, 1931.

Following a severe outbreak of peach rust [*Puccinia pruni-spinosae*: *R.A.M.*, x, p. 470] in the Murrumbidgee area, the New South Wales Ministry of Agriculture recommends growers to remove and burn all diseased wood with the prunings, to keep the leaves buried by cultivation, and to spray the trees with Bordeaux mixture 6–4–22 before the buds burst. If severe defoliation has occurred, every effort should be made to invigorate the trees during the growing season.

BRUCKER (K. W.). **Die Schrotschusskrankheit an Pfirsichbäumen.** [The shot hole disease of Peach trees.]—*Gartenwelt*, xxxv, 41, p. 567, 1 fig., 1931.

During the last two years the causal organism of shot hole (*Clasterosporium carpophilum*), which has been prevalent for some time on cherries in Germany [*R.A.M.*, x, p. 803], has also inflicted considerable damage on the leaves, shoots, and especially on the fruit of peach trees. In the Heidelberg district the most susceptible varieties are Rivers, Hales, York, Weisse Magdalene, Rosenthal's Canning, and Triumph, while Madame Rogniat, Königin der Obstgärten, Proskauer, and Roter Ellerstädter are resistant. The following spray schedule is recommended for the

control of this disease: (1) a dormant application of 15 to 20 per cent. lime-sulphur; (2) 2 per cent. Bordeaux mixture just before the opening of the flowers (also effective against leaf curl [*Taphrina deformans*]); (3) 2 per cent. lime-sulphur immediately after blossoming; (4) the same two to three weeks later.

FAES (H.) & STAEHELIN (M.). **Quelques cas de dépérissement de l'Abricotier en Valais.** [Some cases of dying-off of Apricots in Valais.]—Pamphlet of the *Stat. Fed. d'Essais Vitic., Lausanne,* 6 pp., [? 1931].

During 1930 the writers investigated various cases of dying-off of apricot trees in Valais, Switzerland, bearing some resemblance to the symptoms observed on the same host in France [*R.A.M.*, ix, p. 256]. The disease appears to be confined to three districts, viz., (1) near Martigny (Rhône Valley) in light, sandy soil; (2) at Charbonne on the Saxon slope at an altitude of 700 to 900 m. in loose, rich soil; and (3) at Réchy in the plain, on fairly heavy soil. Neither the situation of the orchards nor the composition of the soil seems to exercise a decisive influence on the course of the disturbance.

The affected trees fall into three groups: (1) characterized by very marked symptoms, including failure to form new shoots in the spring, rapid desiccation, browning of the phloem and cortex of large branches and the trunk, and swelling of the lenticels; (2) in which the same symptoms occur in a less conspicuous form; and (3) comprising individuals showing few external signs of disease apart from stunted growth and chlorotic foliage. Among the fungi found in or on the diseased trees were several true parasites, namely, species of *Clasterosporium*, *Fusarium*, *Monilia*, and *Verticillium*, but so far no evidence of their pathogenicity in respect of the dying-off disease has been obtained. Further studies on the physiological factors associated with the dying-off, as well as on the possible part played by the stock in the etiology of the condition, are considered to be necessary for the solution of a most complex problem.

THOMAS (H. E.). **Verticilliosis of Strawberries.**—Abs. in *Phytopath.*, xxi, 10, p. 996, 1931.

Strawberry plants in soil containing *Verticillium albo-atrum* at San José, California, showed a severe wilting, brown discoloration, or scorching of the edges of the outermost leaves [*R.A.M.*, ix, p. 16]. Partial recovery was observed in a number of plants, but others died. The fungus was readily isolated from the crowns of affected plants but not from the roots. Half the 30 plants inoculated in the greenhouse with *V. albo-atrum* developed the above-mentioned symptoms in five months, and the fungus was reisolated from the diseased crowns. The rest of the inoculated plants and 20 controls remained healthy.

SHEAR (C. L.), STEVENS (N. E.), & BAIN (H. F.). **Fungous diseases of the cultivated Cranberry.**—*U.S. Dept. of Agric. Tech. Bull.* 258, 57 pp., 4 pl. (2 col.), 33 figs., 6 graphs, 1931.

Technical diagnoses, accompanied in most cases by figures, are

given of the 38 most common species of fungi occurring on cranberries in the United States. The organisms fall into three groups, viz., eight important rot fungi, comprising *Godronia cassandrae*, *Glomerella cingulata* [var.] *vaccinii* or *G. rufomaculans* [var.] *vaccinii* [*R.A.M.*, ix, p. 257], *Guignardia vaccinii* [ibid., viii, p. 114], *Acanthorynchus vaccinii* [ibid., vii, p. 334], *Diaporthe vaccinii* Shear, n.sp., *Sporonema oxycocci* [ibid., vi, p. 304], *Ceuthospora lunata* [ibid., viii, p. 452], and *Pestalozzia guepini* [var.] *vaccinii* [ibid., iii, p. 281]; six causing diseases of the cranberry vines, namely, *Sclerotinia oxycocci, Exobasidium oxycocci, E. vaccinii* (considered by some investigators to be synonymous with the foregoing), *Mycosphaerella nigro-maculans* Shear, n.sp., *Synchytrium vaccinii*, and *Psilocybe agrariella* Atk. var. *vaccinii* Charles, n. var.; and fungi of minor importance. A further 31 species are listed as having occasionally been found in cultures from berries, roots, and vines, on berries and on leaves.

D. vaccinii, an important source of storage rot of *Vaccinium macrocarpon* and *V. oxycoccus* var. *intermedium*, is characterized by thick, black, carbonous, nearly hemispherical perithecia, 0·3 to 0·5 by 0·2 to 0·4 mm.; oblong-fusoid, sessile asci, 37 to 51 by 6·8 to 11·7 μ; and irregularly biseriate, ellipsoid, obtuse, bicellular, biguttulate ascospores, 8·8 to 11·8 by 2·4 to 3·4 μ. The thick-walled, black, leathery pycnidia (*Phomopsis vaccinii* n. f. nom.) range from 0·3 to 0·5 mm. in diameter on fruit to 1 to 2 mm. in cornmeal and potato-dextrose agar cultures; the pycnospores are hyaline, unicellular, with two prominent oil drops, long-elliptical, and measure 6 to 11 by 2 to 5 μ; and the fusiform, tapering sporophores are about 15 to 25 μ long in young pycnidia, somewhat longer in older ones; scolecospores were only once observed and were mostly hamate, measuring 14 to 20 by 0·35 μ. Single ascospore isolations from the *Diaporthe* produced typical *Phomopsis* colonies and pycnospores in culture. *Phomopsis* cultures made from decaying berries in the autumn and held over winter in an unheated building in Oregon produced perithecia by the following May, a fair proportion showing both pycnidia and perithecia in the same culture.

M. nigro-maculans n.sp., which also occurs on the above-mentioned species of *Vaccinium*, is characterized by subglobose, thick-walled, ostiolate, black perithecia, 60 to 105 μ in diameter; sessile, cylindrical, often somewhat curved asci, 23 to 35 by 3 to 4·5 μ; and uniseriate or irregularly biseriate, hyaline, bicellular, long-ellipsoid ascospores, 7·5 to 10 by 1·75 to 4 μ. The conidia (*Ramularia nigro-maculans* n. f. nom.), grown in culture from single ascospore isolations, are faint yellowish-brown, globose to elliptical, concatenate, unicellular, 2 to 6 by 2 to 3·5 μ, and are borne on pale yellowish-brown conidiophores, 2 to 3 μ in diameter. The new species appears to be closely related to *M. punctiformis* [ibid., vi, p. 177], from which it differs, however, in its slightly narrower asci and ascospores, perithecia confined to distinct black spots on the stems, berries, and leaves, in its pathogenicity, and in its host.

The physiology of the cranberry rotting fungi is discussed in some detail, with special reference to time of infection, dissemina-

tion, acidity, and temperature relations, and relative abundance of the fungi in different regions, particularly as affected by climatic conditions. Notes are also given on storage rots, attention being drawn to the connexion between general cultural practices in various localities and the control of fruit rot, which is considered under the following aspects: spraying, bog management, harvesting and handling methods, storage, and marketing of the crop. Particulars are also given of the decay of cranberries due to sterile breakdown or senescence.

A bibliography of 86 titles is appended.

TOMKINS (R. G.). **Wastage in the refrigerated transport of Canary Bananas from South America to Europe.**—*Trop. Agriculture*, viii, 10, pp. 255–264, 2 pl., 2 graphs, 1931.

This is a summary of the author's investigation in 1928 and 1930 at the ports of arrival in England, in conjunction with experimental work at the Low Temperature Research Station, Cambridge, of the causes of wastage during transport in cold storage of the Canary variety of banana [*Musa cavendishii*] from South America, chiefly from Brazil. While the conclusions arrived at are in general agreement with those of Wardlaw and McGuire from Trinidad [*R.A.M.*, x, p. 806], the losses in the South American shipments were found to be due mainly to 'ship ripes' (i.e. banana bunches that ripen in the 17 days or so of sea transit), and to main stalk and finger stalk rots. Among the many micro-organisms (including bacteria, moulds, and yeasts) isolated from rotting main stalks, *Gloeosporium musarum* [ibid., x, p. 324] and various species of *Fusarium* were always present, and *Nigrospora oryzae* was also of common occurrence; an interesting feature was the apparently almost complete absence of *Thielaviopsis* [*Ceratostomella*] *paradoxa* which causes such serious stalk rot in the Gros Michel bananas from Jamaica [cf. ibid., x, p. 44], and no damage due to this fungus was observed in the ripening rooms. The majority of the banana bunches arriving in England have their stalk rotted to the extent of three or four inches from the proximal end, in some the stalk is completely rotten for about 12 inches, including the first hand, and in only a few bunches does the stalk remain quite free from infection. The rot was experimentally produced by inoculation of the main stalk with *G. musarum*, and *Fusarium* spp., but it was not established which of these fungi cause most damage. At 56·5° F. (the temperature of the ship holds) only about one inch of the stalk was rotted in 19 days, the progress of the rot in the first ten days being approximately one quarter of that during the second period. These experiments are believed to indicate that in nature, infection most probably occurs at the time when the bunches are harvested, the fungi then making as much progress during the two or three days that precede the cold storage of the fruit in the ship holds as would occur in six to nine days at 56° F. The control measures recommended have already been discussed in a previous paper [ibid., ix, p. 729].

The finger [individual fruit] rot, as distinct from the main stalk rot, is associated with two types of spots, one of which actively spreads, and the other is of a non-spreading nature. The fungi

most commonly isolated from the first were *G. musarum* and a species of *Fusarium*, both of which invariably reproduced the rot in inoculation experiments; occasionally *N. oryzae* and bacteria are also present. The second type of spots yielded an undetermined species of *Pestalozzia* [a brief description of which is given] in 86 per cent. of the cases examined, but when inoculated into sound banana fingers, this fungus either failed to develop or produced a very slight rot. The experiments indicated that at the usual ship hold temperatures finger rot takes 24 to 48 days to develop, this again supporting the view that some fungal activity occurs on the fingers before the bunches are cooled for transit. Observations showed that this rot is the chief cause of the dropping of bananas from the bunches, and that there is a well-marked seasonal variation in its incidence, the maximum numbers of loose bananas in the ships and ripening rooms being found in December, followed by a steady decrease to a minimum in June, after which a steady rise occurs again.

In a final section the author briefly reviews the measures most likely to reduce the wastage of the Canary bananas in transit to Europe to a minimum.

WARDLAW (C. W.). **Banana diseases. I. Observations on Botryodiplodia fruit rot of the Banana.**—*Trop. Agriculture*, viii, 9, pp. 227–230, 8 figs., 1931.

This is an expanded account of the observations and experiments so far made in the study of the serious storage rot of banana fruits caused by *Botryodiplodia theobromae*, some results of which were given in a previous paper [*R.A.M.*, x, p. 806]. Reaped fruit may apparently be attacked by the fungus, which was shown to be essentially a wound parasite, at any stage of maturity, and it was occasionally observed on very immature bananas of the Cavendish variety Trinidad Governor [*Musa cavendishii*] while still on the plants. Field inoculations of fruits on the plants invariably gave negative results. The hyphae penetrate the tissues chiefly along the middle lamellae, but also pass freely from cell to cell; the flesh is rendered soft and pulpy, while the skin becomes dark, wrinkled, and covered with a crust of small black pycnidia. At laboratory temperatures in Trinidad (80° to 85° F.) and in the presence of sufficient humidity, the rot developed rapidly on inoculated bananas of varying stages of maturity, a characteristic effect of the fungus being a premature ripening of the fruit tissues in advance of its progress. The parasitic activity of *B. theobromae* on the banana is attributed to its rapid growth rate and considerable capacity for utilizing carbohydrates even at high concentrations.

In discussing the taxonomy of the fungus, which is stated to agree closely with previous descriptions of *B. theobromae*, it is suggested that *Diplodia musae* Died. described from Assam may be identical with it.

There was considerable evidence that the period of time that elapses before the infected fruit is placed in cool storage [see preceding abstract] is of fundamental importance in the subsequent development of the rots caused by the fungus, of which the following forms were observed, namely, main stalk rot, finger dropping, finger-

tip disease, and fruit spots and blemishes. It appears probable that control of this disease in transit depends in a large measure on curtailing to a minimum the time elapsing between reaping and cooling down the cargo in the holds to 53° F.

LINFORD (M. B.). **Further studies of transmission of the Pineapple yellow-spot virus by Thrips tabaci.**—Abs. in *Phytopath.*, xxi, 10, p. 999, 1931.

Further studies on the transmission of the pineapple yellow spot virus by *Thrips tabaci* [in Hawaii] revealed a specialized relationship between virus and insect [*R.A.M.*, xi, pp. 78, 116]. *Emilia flammea* was the chief test plant, supplemented by pineapple and others. The thrips were from three non-infective colonies reared each from an individual larva. The virus survives pupation and is transmissible by a single insect. Adults from non-infective colonies do not appear to become infective after feeding on diseased plants, but their progeny, developing on the same plants, acquire the infective principle. Larvae from non-infective colonies also become infective through feeding on diseased plants, and may transmit the virus while still in the larval stage or as adults. The incubation period in the larvae lasts about ten days. Yellow spot is not easily transmissible by mechanical means. The hosts of this disease include members of several unrelated families.

ILLINGWORTH (J. F.). **Preliminary report on evidence that mealy bugs are an important factor in Pineapple wilt.**—*Journ. Econ. Entom.*, xxiv, 4, pp. 877–889, 1 pl., 1931.

During the last four years the writer has accumulated evidence that the mealy bug *Pseudococcus brevipes* is largely concerned in the transmission of pineapple wilt in Hawaii [cf. *R.A.M.*, ii, p. 109; v, p. 716; viii, p. 53]. This disease, which is stated to be common wherever pineapples are grown, is characterized by flaccidity and a reddish or yellow discoloration of the leaves, followed by desiccation. These symptoms are not due, as generally supposed, to the death of the roots, since large normal plants were found to remain alive and green for months in the absence of soil roots. Infection usually starts near the edges of a field whence it rapidly spreads towards the centre. Close inspection of wilting plants shows peculiar greenish spots ('chlorophyll spots') on the upper side of some of the inner leaves, caused by the feeding of wilt-infected mealy bugs, which crawl from diseased to healthy plants as soon as the former become dry. The spots appear on the healthy leaves about a fortnight later, followed in two or three months by wilting of the foliage.

The chlorophyll spots, which constitute an important diagnostic character of wilt, begin far down in the leaf axils where the insects feed. The chlorophyll, apparently stimulated by the biting, concentrates round the individual punctures in circular areas varying from 3 to 7 mm. in diameter. As the leaf grows, the pale or yellow centres become raised; in older spots the centres are darker green, surrounded by a paler halo. At certain stages of development the spots exhibit concentric zonation. Spotting of this type

is frequently observed on planting material, the use of which is evidently responsible for the isolated cases of wilt found even in otherwise healthy fields.

In Hawaii, as in other pineapple-growing countries, the destructive effects of wilt have shown a marked cumulative development, especially during the last two decades. In 1912 J. E. Higgins reported (*Hawaii Agric. Exper. Stat. Bull.* 36, p. 30) that the disease caused little damage, but by 1920 whole fields had been wiped out and the losses have continued unabated since that date. Wilt is now undoubtedly the most serious factor curtailing pineapple production in Hawaii, where the annual losses from this cause are estimated at well over one million dollars.

The results of experiments [which are fully discussed and tabulated] under controlled conditions showed conclusively that mealy bugs convey the wilt infection from diseased to healthy plants after feeding on the former, about three months elapsing before the outer leaves turn yellow though the peculiar chlorophyll spotting appears very soon. Neither the typical chlorophyll spots nor the later symptoms of wilt were produced by mealy bugs that had not first fed on diseased plants.

Cultural measures for the control of wilt should include thorough preparation of the fields, eliminating hold-over stumps, grass roots, and the like; the selection of unspotted plants; and sanitation of field borders. Recommendations for the control of the mealy bug vector are also given.

DICKSON (B. T.), ANGELL (H. R.), & SIMMONDS (J. H.). **The control of soft rot (water blister) of Pineapples caused by Thielaviopsis paradoxa.**—*Journ. Australia Council Sci. & Indus. Res.*, iv, 3, pp. 152–161, 1931.

After stating that pineapple water blister (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [*R.A.M.*, x, pp. 223, 473] is estimated to cause an annual loss in Australia of £10,000 and that an examination of 1,148 diseased fruits in Sydney markets during February and March, 1929, revealed that 75·5 per cent. of the infection originated from the cut surface of the stem, 22·3 per cent. presumably through side wounds, and 2·2 per cent. at or near the junction of the crown and fruit, the authors describe tests with fungicides applied to the cut surface of the stem to prevent the growth of the fungus.

The results [which are tabulated and discussed] showed that benzoic acid applied up to five and a half hours after inoculation with the conidia of *C. paradoxa* completely prevented infection. Salicylic acid gave equally good results and boric acid, borax, and calcium hypochlorite also materially reduced the amount of disease. Laboratory experiments on the effects of inoculation of unwounded and injured surfaces of the fruit lead the authors to conclude that infection by *C. paradoxa* seldom, if ever, takes place except through wounds or bruises.

None of the fungicides mentioned, except benzoic acid, is, however, permissible under the New South Wales health regulations. For commercial purposes the authors recommend brushing the stems with an alcoholic solution of benzoic acid of not under

10 per cent. strength or rubbing them in a mixture of one part benzoic acid to not more than four parts by weight of kaolin.

Laboratory studies of artificially inoculated pineapples showed that water blister develops most rapidly between 23° and 29° C.; below 12° there was no evidence of rot even after seven days. The losses at present incurred would probably be greatly reduced if facilities were available for low temperature transport and storage during summer.

RANT (A.). **Über eine Bakterienkrankheit bei dem Melonenbaume (Carica papaya Linn.) auf Java.** [On a bacterial disease of the Papaw (*Carica papaya* Linn.) in Java.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxiv, 23–26, pp. 481–487, 4 figs., 1931.

Papaw (*Carica papaya*) plants in Java and the Molucca Islands were recently observed by the author to be suffering from a bacterial disease with the following features. In young plants the leaves turn yellow and decay and the upper part dies, the whole plant often becoming involved. Dry spots develop and expand on the leaf blades of larger plants, especially along the main veins. Water soaked lesions appear on the petioles and stem and spread rapidly; the affected parts are sticky to the touch owing to the exudation of latex. In some cases the yellow leaf dies before infection reaches the stem. Slender stems gradually die off from the top downwards, but in stouter plants recovery of the affected parts may be observed.

A short, rod-shaped organism with rounded ends, 1 to 1·5 or up to 3 μ in length, was isolated on papaw agar. Some of the individuals were motile while others were non-motile, but in view of the complete agreement of both types in morphological and pathogenic characters they may safely be regarded as identical. The bacterium is Gram-negative but stains faintly with aniline dyes, it does not form spores, is aerobic, produces acids but no gas from glucose, levulose, saccharose, mannitol, and dulcitol, and grows best at room temperature (maximum and minimum 45° and $\pm$10° C., respectively). The organism is named *Bacillus papayae* n. sp.

Inoculation experiments with bacterial suspensions (motile and non-motile) gave positive results both on wounded and unwounded petioles. In one test only three out of 45 inoculations on the leaf blades were successful, compared with 25 out of 41 on the petioles, presumably owing to the large number of stomata serving as points of ingress for the bacteria on the latter organs. Stomata are present on the under side of the leaf but absent from the upper, and in a laboratory test 13 out of 19 inoculations were successful on the former compared with two or three on the latter. Inoculation experiments on a number of other cultivated plants [which are enumerated] gave entirely negative results.

Ants were observed to transmit infection from petiole to petiole on the same plant, and probably flying insects carry the organism from one plant to the next. Diseased organs should be cut off and burnt immediately.

Miss E. M. Doyer reports that papaws in the Semarang district

of Java suffer from a similar disease, the causal organism of which, however, appears to be much less virulent than the foregoing.

WOODMAN (R. M.). **An examination of some commercial suspensions used in the spraying of plants.**—*Journ. Soc. Chem. Ind.*, l, 42, pp. 391T-397T, 6 figs., 1931.

The writer discusses and tabulates the results of his investigations, conducted at the Cambridge Horticultural Research Station, of some commercial suspensions used for the spraying of plants.

Ialine sulphur [*R.A.M.*, ix, pp. 467, 794], manufactured by Burt, Boulton & Haywood, Ltd., is dependent on the minute size of the sulphur particles for its suspension, nitrogen-containing protective colloids being absent. The firm recommends the addition of soft soap to the water used for making a suspension, probably to enhance the wetting and spreading capacity. Ialine is considered to be probably the most successful commercial sulphur at present available for forming spraying suspensions.

The toxic agents in bouisol (a suspension to replace ordinary Bordeaux) and sulsol (a sulphur suspension) are, according to the manufacturers (Einstein's Electro-Chemical Process, Ltd.), ground in patented machinery in such a way that the particles are 'decohesionized', the process being carried out in the presence of water, a small quantity of protective colloid, and an anti-putrescent agent. After sedimentation the suspensions contain about 20 per cent. of the toxic agent.

The total solids in the bouisol, sulsol, and ialine sulphur suspensions were 29·50, 13·29, and 29·69 per cent., respectively. The two sulphur suspensions were diluted to 2 per cent. solids present, a second 2 per cent. ialine, to which 0·5 per cent. soft soap was added was included, and a bouisol suspension was prepared to contain the same amount of solids as that present in a Bordeaux mixture of 1 gm. $CuSO_4$, $5H_2O$; 1 gm. CaO (98 per cent.); 160 c.c. water. Fifty c.c. of these suspensions were placed in 50 c.c. stoppered cylinders and photographed from time to time. Photomicrographs were also made of drops of the suspensions on glass slides. Bouisol showed no signs of clearing in three hours while the Bordeaux mixture showed 6 c.c. of clear supernatant liquid. After 24 hours ageing, reshaking, and placing aside, the Bordeaux mixture gave clear supernatant layers of 8·75 and 18·5 c.c. in 15 and 30 minutes, respectively, while bouisol again showed no sign of sedimentation. The clearing and sedimentation of the sulphur suspensions could be followed better by the eye than by photography; after 20 days the ialine plus soap suspension was practically clear of sulphur, the ialine suspension without soap showed 27 c.c. of clear supernatant liquid, while the sulsol suspension had only partially cleared to a depth of 3 c.c. The photomicrographs indicated that bouisol was much more finely particled than Bordeaux, while the sulphur particles in sulsol and ialine (especially the former) were also very fine and evenly distributed. The addition of soap to ialine, though promoting wetting and spreading, appeared to cause the coagulation of the sulphur to larger particles. The photomicrographs of the solid

residues left after the drying of these droplets were very similar and were compared with photomicrographs of (*a*) flowers of sulphur, (*b*) kolodust (Niagara Co.) [*R.A.M.*, x, p. 441], (*c*) a dry sulphur spray sold by G. Monro, Ltd., and (*d*) one sold by Butler & Co. Flowers of sulphur was found to have the smallest particles of these dry sulphurs. Sulsol was finer and more evenly distributed than ialine, while ialine plus soap was a more coarse-grained film with few sulphur particles. In all these three preparations, however, the particles were smaller than the agglomerates obtained with the dry dusts. The superior stability of sulsol appears to be almost entirely attributable to the fineness of its particles.

DEL GIUDICE (E.). **Alcune esperienze sull'azione anticrittogamica dello solfo.** [Experiments on the fungicidal action of sulphur.] —*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 128–137, 1931.

After referring to the different opinions which prevail as to the true nature of the fungicidal properties of sulphur [*R.A.M.*, ix, pp. 468, 732, 733; x, p. 741] the author describes a number of laboratory and field tests made as to the relative value of the two wind-blown natural raw sulphurs known, respectively, as 'solfo greggio ventilato S.A.I.M.' [ibid., viii, p. 545; ix, p. 286] and 'solfo greggio Romagna M.S.R.' [ibid., viii, p. 701], pure, wind-blown sulphur, and of pure, sublimed, commercially prepared sulphur. The first-named consists of 36·25 per cent. sulphur, 48·5 per cent. calcium carbonate, 7 per cent. magnesium carbonate, 6·7 per cent. calcium sulphate, and 1 per cent. clay, while the second contains 34·4 per cent. sulphur, 46 per cent. calcium carbonate, 5 per cent. magnesium carbonate, 5·5 per cent. calcium sulphate, 2·5 per cent. silica, and 5 per cent. organic matter. The P_H values of pure wind-blown sulphur, the pure sublimed sulphur, the S.A.I.M., and the Romagna M.S.R. were, respectively, 6·8, 3, 7·6, and 7·7.

When these dusts were tested upon aqueous suspensions of the conidia of *Erysiphe graminis* and the uredospores of *Puccinia glumarum* the percentages of spores of the former which germinated after four days were: control in distilled water only ($P_H = 7$) 29, ditto plus sublimed sulphur 2, ditto plus pure wind-blown sulphur 2, ditto plus S.A.I.M. 9, and ditto plus M.S.R. 18. The corresponding figures with *P. glumarum* were 29, 1, 6, 8, and 19 per cent., respectively. These tests were carried out in diffused sunlight; with both organisms the relative fungicidal values of the different treatments remained the same when the tests were repeated in darkness. The fungicidal superiority of the sublimed sulphur with P_H value 3 is clearly evident from these results, especially when compared with the M.S.R. with P_H 7·7.

The difference in the fungicidal efficacy of these two forms appearing disproportionate to their respective P_H values, the author investigated what effect the P_H value of the water (modified by adding sodium carbonate or sulphuric acid) had on the germination of the spores. It was found that a P_H value of 3·6 reduced germination by three-quarters in 24 hours, while one of 8·2 caused less reduction. The author considers that an acid reaction undoubtedly increases the fungicidal activity of sulphur.

Tests of the germination of the spores of *P. glumarum* treated with aqueous filtrates of the various forms of sulphur gave the following percentage germinations after 24 hours: control (distilled water) 15, pure sublimed sulphur 2, pure wind-blown sulphur 4, S.A.I.M. 5, and M.S.R. 7, the P_H values of the liquids being 7, 3, 6·8, 7·6, and 7·7, respectively. The depression of germination caused by the pure, sublimed sulphur is considered to be due to the formation of pentathionic acid [ibid., x, p. 555].

When the various forms of sulphur tested were placed on healthy wheat leaves and other wheat leaves artificially infected with *P. glumarum* only the raw, wind-blown S.A.I.M. sulphur produced hydrogen sulphide. The P_H value of the water used had no effect on the liberation or otherwise of this gas. No hydrogen sulphide was produced when the sulphur was deposited on an inert surface, such as glass, but it was constantly produced by the S.A.I.M. sulphur in 24 to 48 hours when placed on a living leaf attached to the plant and having numerous stomata [cf. ibid., x, p. 741].

In the author's opinion, there is no doubt that under certain as yet incompletely determined conditions, but which as regards the natural wind-blown S.A.I.M. sulphur must partly consist in the nature of the gangue with its content of calcium and gypsum, the sulphur goes through a process of hydrogenation with the resultant formation of hydrogen sulphide. This probably accounts for the slightly superior efficacy of the S.A.I.M. sulphur as compared with the M.S.R.

Field tests in which each of the three wind-blown sulphurs was applied to wheat affected with *P. triticina* completely confirmed the results of the laboratory experiments, the plot showing the least disease being that treated with the pure wind-blown sulphur and that most affected (after the untreated control plot) being the one treated with M.S.R.

The natural sulphurs, though less efficacious in these tests than the pure forms, are nevertheless good enough for all practical purposes.

Bech (P.), Bruun (S.), Friis (S.), Jensen (C. E.), Nielsen (V.), Pedersen (A.), & Risum (J. N.). **Hovedprøve med Motorfrugttræsprøjter.** [Main experiments with motor fruit tree sprayers.]—*Statens Redskabsprøver Beretning* 64, pp. 1–45, 12 figs., 6 diags., 1931.

Full technical details, supplemented by 13 tables, are given of the construction and application of four motor spraying apparatus for fruit trees—the first to be tested in Denmark—namely 'Platz' (Brødr. Bendix, Gl. Torv 18, Copenhagen K), 'Friend' (Ingeniør J. Hansen, Østerbrogade 2A, Copenhagen Ø), 'Sigvardt' (Fabrikant R. Sigvardt, Orehoved Motorfabrik, Orehoved), and 'Bean' (Grosserer J. Svendsen, Bernstorffsgade 17, Copenhagen K). All the machines gave eminently satisfactory results. A stationary spraying apparatus, the 'Bean' triplex pump, suitable for working an area of about 2 hect., was also inspected. The prices of the apparatus are as follows: 'Bean' Kr. 2,250, 'Friend' Kr. 1,800, 'Platz' Kr. 2,085, and 'Sigvardt' Kr. 1,800.

TULASNE (L. R.) & TULASNE (C.). **Selecta Fungorum Carpologia.** Translated into English by W. B. Grove.—Vol. i, A to DD + i to xxvi + 250 pp., 5 pl.; vol. ii, i to xxiv + 304 pp., 34 pl.; vol. iii, i to xx + 208 pp., 22 pl., Oxford University Press, 1931.

After some 70 years these classical volumes have been worthily translated into English. The originals have been reproduced as closely as possible both in the format and typography of the text, and in the collotype reproductions of the famous plates. After prefaces by the editors (A. H. R. Buller and C. L. Shear) and the translator, four obituary notices of the brothers are inserted; and these recall the estimation in which they were held in their own day.

The first volume is mainly devoted to an account of the nature and structure of fungi, and of various hypotheses dealing with them. The authors then settle down to descriptions of genera and species of the Ascomycetes and of the Imperfect Fungi that they held to be associated with each. The species were nearly all collected alive by the authors ('and more than once'), and were selected as furthering their hypothesis of the polymorphism of the Ascomycetes. Rather more than 200 species were described, and of these nearly 150 were figured. They refrained from making new species unaccompanied by figures as they found that 'we are unequal to the task of describing many of these fungi so satisfactorily in words alone, that a mycologist may safely recognize to which we refer'. It was this plain account of repeated collection and accurate description, and above all else, this welding of discreet specimens into living species that earned for one brother the title of 'Reformer of Mycology'. It is the 'superb illustrations' of the other, 'the despair of later botanists' which played, and still play, such a part in introducing students to these difficult genera. It might have been thought that by this date all the suggestions as to the different spore forms of these species would have been confirmed or refuted; a melancholy number, however, remain in the category of not proven.

Appendices by the editors at the end of each volume give the currently accepted names of the fungi.

HANSEN (H. P.). **Om resistens mod smitsomme plantesygdomme.** [On resistance to infectious plant diseases.]—*Ugeskr. for Landmænd*, lxxvi, 42, pp. 662-664, 1931.

Some general observations, supported by concrete examples, are made concerning the various factors involved in the resistance or susceptibility of plants to fungous and bacterial diseases.

VERNON (T. R.). **An improved type of moist chamber for studying fungal growth.**—*Ann. of Botany*, xlv, 180, pp. 733–737, 2 figs., 1931.

Finding in a preliminary study of the moulds occurring on dairy products that the fine structure of the conidiophore and the arrangement and mode of attachment of the conidia are difficult to detect in ordinary Petri dish cultures or hanging drops, the writer devised the following technique for this purpose. A small

quantity of hot medium (80° to 90° C.) is placed on a sterile slide and flattened, just before setting, by means of a sterile cover slip, which is removed from the disk of medium as soon as the latter has thoroughly set (in about two minutes). The disk is then cut across diametrically with a sterile knife or razor blade and half pushed to one side, leaving a space of ½ to 1 cm. between the cut surfaces, one of which is inoculated and rapidly covered with a sterile cover-slip. The culture is then incubated in a moist atmosphere. Gelatine media are not suitable for this method owing to the risk of tearing by removal of the cover-glass, but any agar medium may be used, a plain 2 per cent. agar having given good results with many organisms. A great advantage of this method is that the main direction of growth is at right angles to the line of vision, so that a lateral view of the developing structures is obtained.

MELIN (E.). **Investigations of the significance of tree mycorrhiza: an ecological-physiological study.**—175 pp., 48 figs., Ann Arbor, Michigan, Edwards Bros., 1930. [Mimeographed.]

This is a translation from the German by P. W. Stickel of Melin's book on the ecology and physiology of tree mycorrhiza, the German edition of which has already been noticed [*R.A.M.*, v, p. 245].

VERPLANCKE (G.). **Dégâts causés à la végétation par les émanations des usines.** [Injury to vegetation caused by fumes emanating from factories.]—Reprinted from *La Tribune Hort.*, xxv, 717–720, 14 pp., [? 1931].

The author describes in some details the injury caused to cultivated plants in Belgium by the fumes emanating from industrial factories, each of the noxious products being considered separately. While freely admitting that the complaints of agriculturists in this regard are often well supported by evidence, he considers that in many cases they are due to prejudice, as shown by a few instances quoted by him. The suppression of existing factories by local or central authorities, following such complaints, should only be resorted to after exhaustive investigation.

ANGELL (H. R.) & HILL (A. V.). **The longevity of the conidia of certain fungi (Peronosporales) under dry conditions.**—*Journ. Australia Council Sci. & Indus. Res.*, iv, 3, pp. 178–181, 1931.

When the conidia of the *Peronospora* causing downy mildew or blue mould of tobacco were placed in desiccators at 16° to 18° C. they retained their viability for 35 days; the conidia of *P. parasitica* from cabbage showed a trace of germination after desiccation for ten days at 2° or at 16° to 18°, while those of *Bremia lactucae* from lettuce gave 1 per cent. germination after 35 days' desiccation at 2° or after 17 days at 2° with 60 to 70 per cent. relative humidity, and 70 per cent. germination after ten days at 2° with 60 to 80 per cent. relative humidity.

The experiments with the tobacco *Peronospora* [*R.A.M.*, x,

p. 492] also appeared to indicate that at certain temperatures the viability of conidia undergoing desiccation may be longer than that of conidia in ordinary or water-saturated atmospheres.

In no experiment was germination obtained after more than nine days in ordinary laboratory conditions.

HAINES (R. B.). **The influence of temperature on the rate of growth of Sporotrichum carnis, from −10° C. to +30° C.**—*Journ. Exper. Biol.*, viii, 4, pp. 379–388, 2 figs., 4 graphs, 1931.

Sporotrichum carnis is stated to be of frequent occurrence on lean stored meat kept for eight to ten weeks at a temperature below 0° C. but above −10° [*R.A.M.*, iii, p. 53; ix, p. 185]. Experiments were conducted at the Low Temperature Station, Cambridge, to determine the influence of temperature on the development of this mould.

Growth rate measurements on Czapek's agar indicated that the optimum temperature for growth is 25°; at 30° development is restricted and the germ-tubes from the spores are abnormally thickened. Fairly good, though slow growth was obtained at −5° on supercooled agar; here also the development of the fungus was limited and the germ-tubes tended to become thicker and curl more readily than at higher temperatures.

A curve is given showing the relation between temperature and growth rate during the logarithmic phase, from which it appears that growth on supercooled agar becomes infinitely slow at −10°. The application of the Arrhenius–van't Hoff equation to the results obtained is briefly discussed.

PETRI (L.). **Maculatura interna ereditaria dei tuberi di Patata.** [Internal hereditary spotting of Potato tubers.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 2, pp. 171–175, 1 fig., 1931.

A description is given of the internal spotting of potato tubers characteristic of hereditary sprain [*R.A.M.*, ix, p. 199] which has been known in Italy for three or four years. In the winter of 1930–31 tubers received from Germany were found to be affected. These were sown in three separate localities, with the result that nearly all the new tubers dug up the following spring showed the condition. The disease comes into category 5 of Quanjer's classification of potato virus diseases [ibid., x, p. 746], is hereditary through the tubers, and is transmissible in the tissue juices by means of artificial inoculations or insect vectors. It is quite distinct from the condition known in France as 'maladie des tâches en couronne', in Holland as 'kringerigheid' and in Germany as 'Pfropfenbildung' which partly corresponds to internal brown spot. The last-named originates in the lenticels, is not hereditary, and falls into category 6 of Quanjer's classification.

ELZE (D. L.). **De overgang van virusziekten met het zaad, in het biezonder bij de Aardappel.** [The transmission of virus diseases with the seed, especially in the Potato.]—*Tijdschr. over Plantenziekten*, xxxvii, 10, pp. 189–197, 2 pl., 1931.

In connexion with a general survey of contemporary investiga-

tions on the mode of transmission of the virus diseases, especially of potatoes, the writer briefly summarizes the results of his recent experiments in the transmission of aucuba mosaic and leaf roll, a more detailed account of which has already appeared [*R.A.M.*, x, p. 813].

WHITEHEAD (T.). **On the transmission of Potato leaf-roll by Aphides.**—*Ann. of Appl. Biol.*, xviii, 3, pp. 299–304, 1 pl., 1931.

A brief account is given of experiments under greenhouse conditions in 1929 and 1930, the results of which established that the aphid *Myzus circumflexus* is as efficient a vector of potato leaf roll as *M. persicae* [*R.A.M.*, x, p. 49; cf. also x, p. 813]. It was noted, however, that in 1930 leaf roll symptoms took 16 days longer to develop on potato plants (President variety) infected by means of *M. circumflexus* than on those inoculated by *M. persicae*, and the academic and practical implications of this fact are discussed. *Macrosiphum gei*, in parallel experiments, transmitted the disease only once, thus leaving its importance as a carrier in the field still open.

MALHOTRA (R. C.). **Biochemical investigation of mosaic in Solanum tuberosum.**—*Journ. of Biochem.*, xiii, 3, pp. 473–487, 1931.

After a brief review of some of the literature on mosaic diseases of plants, the writer gives an account of his biochemical studies at St. Mary's, Kansas, on healthy and mosaic Burbank potatoes, the latter being infected by the expressed sap of a true tomato mosaic plant.

The results [which are tabulated and discussed] of an analytical examination of the experimental material indicated that healthy plants made better growth, both on the fresh and dry weight basis. The percentage of dry matter, however, was higher in the mosaic plants. Percentages of ether extract, non-reducing sugars, starch, hemicelluloses, and calories of heat per gram were higher in healthy plants, while nitrogen and inert materials (including cellulose) were relatively more abundant in diseased individuals. The percentage amounts of ash and reducing sugars were approximately equal in both lots.

JONES (A. P.). **The histogeny of Potato scab.**—*Ann. of Appl. Biol.*, xviii, 3, pp. 313–333, 2 pl., 3 figs., 1931.

This is a detailed account of the author's study of the histological lesions in potato tubers caused by common scab, of which he distinguishes two types, namely, the pitted type resulting from attacks by *Actinomyces scabies*, and the raised or 'tumulus' type caused by *A. flavus* Millard and Burr [*R.A.M.*, vi, p. 179]. In the first type infection may start in a tuber lenticel before its suberization, the meristem being then stimulated to division and producing an elongated type of cell; the new cells are invaded and killed by the fungus, but after a time a barrier of wound cork

is laid down. The organism is able, however, to grow through incompletely suberized cells in this barrier and to infect the cells below, when the process is repeated. No more than three cork barriers were found in any one scab, but this is believed to be due to arrest of the active growth of the tuber. The parasite was observed within the host cells in all stages of scab, and has also been induced to grow in the living tissues of potato rootlets, etiolated potato shoots, and in plugs of tuber tissue. It was seen to fructify freely and typically in the tissues of mature scabs and of potato plugs. The organism was finally shown to form brown, actinomycetous nodules on the roots developing from inoculated shoots, and to attack the cortical cells of such roots, greatly hindering the normal development of the root system.

The scabs of the raised type were found to be more superficial and to have only one cork barrier separating them from the healthy tissue. In naturally formed scabs of this type a species of *Actinomyces* was seen, closely resembling *A. flavus* in the characters of the sporophores and spores, both in pure culture and in scabs artificially produced by inoculations with it. The organism was shown to grow less rapidly than *A. scabies*, a fact which may account for its inability to grow through the first cork barrier.

The formation of wound cork below the scabs is thought to be possibly due to the development, during the early stages of invasion, of a gradient of P_H values in the tuber tissues favourable to cell division [cf. ibid., iv, p. 305; vi, p. 46], while in later stages, owing to the increased activity of the organisms in the infected regions, conditions favouring suberization are set up in the newly divided tissues. The suggestion is made also that the period of susceptibility of potato tubers to, at least, the pitted form of common scab, is probably determined by the degree of suberization of the tuber lenticels.

CHAMBERLAIN (E. E.). **Corticium disease of Potatoes. I. Propagation and spread of the disease.**—*New Zealand Journ. of Agric.*, xliii, 3, pp. 204–209, 4 figs., 1931.

After stating that the disease caused by *Corticium vagum* [*C. solani*] is one of the commonest troubles of potato crops in New Zealand, the author gives brief details of experiments started in 1928 at Palmerston North, the results of which indicated that in one-year crop rotation tests an apparent reduction in the degree of infection of the soil was only brought about when the potatoes followed grass, and not when following cereals, peas, or turnips. Further experiments showed that under market-gardening conditions *C. solani* persists in the soil for several years, and that under field conditions, with a normal distance of 14 inches between the potato hills, which were planted alternately with infected and healthy tubers, the spread of the disease through the soil led to an increase in the number of diseased plants of between 23 and 62 per cent. The latter fact is considered to explain the natural increase of infection of potato lines with *C. solani*. Infection was also shown to spread from diseased to healthy tubers stored in sacks.

CHEAL (W. F.). **Experiments on Potato sickness.**—*Ann. of Appl. Biol.*, xviii, 3, pp. 401–403, 1 pl., 1931.

The author states that the results of his experiments in 1930, in continuation of his study of the causes of 'potato sickness' of soil [*R.A.M.*, ix, pp. 125, 335], showed that potato plants in pots of sterilized earth inoculated with *Corticium solani*, *Colletotrichum atramentarium*, and *Heterodera schachtii* cysts, were definitely retarded in their initial growth, but later appeared to make up leeway, and finally almost caught up with the controls. Tubers naturally infected with *C. atramentarium* again failed to produce diseased plants, in confirmation of the results of the previous year's work [loc. cit.; cf. also x, p. 546].

POLI (P.). **Studio sul 'mal del collo' del Riso.** [Study on 'collar rot' of Rice.]—*Giorn. di Risicolt.*, xxi, 10, pp. 149–157, 2 figs., 1 graph, 1931.

The average loss from 'collar rot' or 'brusone' of rice [*R.A.M.*, vii, p. 394] in the province of Vercelli [Piedmont] may be estimated at 10 to 15 per cent., while in severe cases the yield may be reduced by 40 to 50 per cent. The Originario and Americano 1600 varieties have been found most susceptible. A study of the meteorological records for the period from June to September, 1931, indicates that the disease is favoured by continuous sharp fluctuations in temperature, such as occurred during the abnormal summer of that year, rather than by temporary cool spells.

BOBILIOFF (W.). **Anatomisch onderzoek bij de topinstervingen van jonge Hevea-uitloopers.** [Anatomical investigation of young *Hevea* shoots suffering from top die-back.]—*Arch. voor Rubber-cult. Nederl.-Indië*, xv, 10, pp. 627–635, 10 figs., 1931. [English summary.]

In the non-parasitic die-back of budded *Hevea* rubber shoots in Java [*R.A.M.*, xi, p. 72], as in that caused by *Phytophthora* [*palmivora*], the tops wither and shrivel, while the leaves also wither, blacken, and finally drop. These features pointed to the obstruction of the water supply by a stoppage in the conducting channels, and this was actually found to occur at the junction of the scion with the stock. In severe cases the scion dies off completely, but where the stoppage is slighter one or more lateral buds usually develop after the death of the top of the shoot. Similar manifestations are found on non-budded shoots arising from stumps with thick stems and sometimes on the shoots developing from trees of which the crowns have been removed owing to damage from wind or other causes.

The stoppage was mainly due to internal fissures which may form at the point of origin of a normal shoot from a thick stem, and also at the juncture of stock and scion; these become filled with coagulated latex extruded from the surrounding ruptured tissue. Sometimes there is an outgrowth of wound-tissue as well as a latex flux into the fissure. Such fissures, the exact cause of which is not known, exert a very adverse influence on the subsequent development of the shoot, which remains stunted and

swollen, while the new shoots that are formed fail to attain their full size.

OCFEMIA (G. O.). **The diseases of Sugar Cane occurring at the College of Agriculture at Los Baños and in the immediate neighbourhood.**—*Sugar News*, xii, 9, pp. 595–599, 1931.

Brief, popular notes are given on the following diseases of sugar-cane occurring at or near Los Baños, Philippine Islands: bacterial stem rot (*Bacillus sacchari*) [*R.A.M.*, x, p. 690], banded sclerotial disease (*Rhizoctonia* [*Corticium*] *solani*), leaf spot (*Cercospora kopkei*), Fiji disease, eye spot (*Helminthosporium sacchari*), leaf scald (*Bacterium*) [*albilineans*], mosaic, pineapple disease (*Ceratostomella paradoxa*), pokkah-boeng (*Fusarium moniliforme*) [*Gibberella moniliformis*], red rot (*Colletotrichum falcatum*), ring spot (*Leptosphaeria sacchari*), root rot associated with *Pythium* [ibid., xi, p. 5], rust (*Puccinia kuehnii*), *Sclerotium* disease caused by a fungus of the *S. rolfsii* group, smut (*Ustilago scitaminea*), and wilt (*Cephalosporium sacchari*).

ROLDAN (E. F.). **A bacterial stem-rot of hybrid Cane seedlings hitherto unreported.**—*Philipp. Agric.*, xx, 4, pp. 247–260, 5 pl., 1931.

This is an expanded account of the writer's studies on the newly discovered stem rot of hybrid sugar-cane seedlings in the Philippines caused by *Bacillus sacchari* n. sp. (*Erwinia sacchari* n. sp.) [see preceding abstract].

The following varieties have been found susceptible: Plant Breeding 308, P.B. 309, P.B. 345, P.B. 395, and P.B. 407, which are hybrid seedling canes from crosses between P.B. 119 (female) and C.A.C. 87 (male), as well as on Cagayan Striped. The first noticeable symptom of the disease is a yellow to yellowish-brown discoloration of the entire foliage, followed by rolling and wilting. Rapid discoloration to a pale greenish-yellow hue and softening of the inner tissues of the stalk next ensues, accompanied by rotting of the side buds and the region of the growing point of the shoot, with the result that the tops of infected stalks fall over a few centimetres below the spindle. This process is accelerated by cool, humid conditions. In the advanced stages of the disease the infected stalks emit an unpleasant odour of fermentation and putrefaction. The rind loses its natural gloss and becomes dull, as though scalded with hot water. In the young, tender tissues of the growing region fissures, apparently due to cell disorganization by bacterial action, may be seen running parallel with the fibres. The disease may occur on young canes about 60 cm. in height but is more common on those approaching maturity.

The causal organism [a technical diagnosis of which is given in English] was readily isolated on nutrient broth or cane juice-peptone-water. *B. sacchari* is a cylindrical rod with rounded ends, occurring singly, in pairs, or occasionally in chains and clumps, and measuring 0·95 to 2·2 by 0·5 to 0·7 μ. The rods stain readily with carbol fuchsin and aniline gentian violet; they are motile by means of four or more peritrichiate flagella. Heavy pellicles are formed in beef peptone, cane juice-peptone, and in

Cohn's and Fermi's solutions. On agar-beef-peptone the colonies are circular, raised, umbonate, smooth, pale green, and homogeneous, the buried ones being fusiform and variously umbonate. The yellow coloration of the organism on potato plug agar is not considered to represent true chromogenesis. Gelatine is liquefied, milk coagulated, and ammonia and indol produced. Acid is formed with evolution of gas in saccharose, mannite, raffinose, lactose, maltose, levulose, xylose, rhamnose, and melozitose, and acid without gas in glycerine, dextrin, dulcitol, and inulin. The optimum temperature for growth is 30° to 35° C. at a range of -20 to $+20$ Fuller's scale (optimum $+10$). In 24- and 48-hour-old fluid cultures *B. sacchari* succumbs to desiccation in 24 hours.

Inoculation experiments with pure cultures of the organism on hybrid seedling canes in the field gave positive results, 60 to 90 per cent. of infection being caused by inoculation through the spindle, compared with 30 to 60 at the base. The symptoms induced by the latter mode of inoculation agreed exactly with those occurring in nature, whereas in the case of spindle inoculation infection was confined to the growing point. The incubation period ranged from 3 to 7 days for inoculation through the spindle and from 6 to 10 days through the base.

In its present form the bacterial stem rot may be readily controlled by the eradication and burning of diseased stools as soon as infection is observed among them. No cuttings for planting should be taken from stools containing diseased stalks. In cases of severe infection the stalks of the stools should be cut and burnt with the stubble, while the soil should be ploughed up and exposed to direct sunshine to dry and so kill the bacteria harboured in the cane débris.

Bell (A. F.). **Sources of gumming infection.**—*Australian Sugar Journ.*, xxiii, 7, p. 365, 1931.

In response to a request for information as to the advisability of planting sugar-cane immediately after the ploughing in of a crop affected by gumming [*Bacterium vascularum*] in the Bundaberg area of Queensland [*R.A.M.*, x, pp. 128, 339], the writer states that this practice must be condemned outright. A number of volunteer stools are almost certain to grow out from the remains of those of the old crop. In the ordinary way these would be destroyed by a subsequent ploughing, but with immediate replanting they grow up among the shoots of the new crop and rapidly infect the latter as soon as suitable wet weather conditions occur, notwithstanding the use of healthy setts. If, however, planting is delayed until after the destruction of the volunteer stools, the new crop will be safe, since experiments have shown that the gumming organism is not transmissible through the soil.

Roxas (J. V.). **An agronomic study of Indian Cane varieties, Rakhra, Hemja, Chunnee and Saretha.**—*Sugar News*, xii, 8, pp. 516–522; 9, pp. 579–586; 12, pp. 860–864, 1931.

No serious diseases were observed during the period of the writer's observations on the Indian sugar-cane varieties under investigation in the Philippine Islands, except for red rot (*Colleto-*

trichum falcatum) on a few stalks of Saretha, Rakhra, and Chunnee. Leaf spot caused by *Cercospora kopkei* [see next abstract] was found on Hemja, Saretha, and Chunnee.

BOLLE (P[IERRETTE] C.). **Voorloopige proeven en beschouwingen over bestrijding van de geelvlekkenziekte.** [Preliminary tests and observations on control of the yellow spot disease.] —*Arch. voor Suikerind. Nederl.-Indië*, Deel III, xxxix, 27, pp. 1189–1206, 1 graph, 1931.

After an introductory survey of the history of yellow spot disease of sugar-cane (*Cercospora kopkei*), with special reference to its occurrence in Java [*R.A.M.*, x, p. 299], the writer discusses and tabulates the results of her experiments in the control of the fungus on a P.O.J. 2961 planting on the Malang plateau.

The following preparations were used: (1) 1 per cent. alkaline or neutral copper acetate; (2) Bordeaux mixture (0·5 per cent. calcined lime in 1 per cent. copper sulphate plus 1 per cent. sugar); (3) Bordeaux mixture converted into powder by centrifuging, drying, pounding, and the addition of talc; (4) anhydrous copper sulphate and lime with talc; (5) sulphur dust ('sulphur smoke', supplied by the firm 'Internatio' at a cost of Fl. 17 per 100 kg.) [ibid., x, p. 749] mixed with 1 per cent. finely ground potassium permanganate. For the liquid sprays the Holder spraying battery was used and for the dusts the Rebschwefler Tip-top duster [ibid., vii, p. 556], both of which proved effective. Infection counts and sap analyses showed that all the fungicides except (3) reduced the incidence of *C. kopkei* and also increased the sugar content of the treated canes. They were, moreover, completely resistant to washing off, even by heavy rains. For practical purposes (5) may be specially recommended as being both economical and easy to apply. It would appear that four to six fortnightly applications during the last two or three months before an early harvest are sufficient.

SAWADA (K.). **List of fungi found in Formosa.**—103 pp., [Govt. Res. Inst., Taihoku, Formosa, ? 1931].

An alphabetical list without references is given of over 740 fungi found in Formosa, Japan [*R.A.M.*, x, p. 555], together with alphabetical host indices of scientific and common Japanese names.

LEONIAN (L. H.). **Heterothallism in Phytophthora.**—*Phytopath.*, xxi, 10, pp. 941–955, 7 figs., 1931.

With a view to extending present knowledge on the phenomenon of heterothallism in the genus *Phytophthora*, the author collected and paired in hundreds of cultures some 85 strains of *P. omnivora* in the sense previously used by him [*R.A.M.*, v, p. 5; cf. also vii, p. 602; x, p. 755] occurring largely in the tropics. Four distinct groups were segregated, viz., homothallic, heterothallic, inconstant, and neutral. The forms of the inconstant group were sometimes heterothallic and sometimes neutral (i.e., producing no oospores whether paired with strains of the opposite sex or not). Of the 48 true heterothallic cultures half were male and half female. Oogonia were produced solely as the result of mating male with

female strains on oatmeal agar, the only medium inducing sexual reproduction. Sexual reproduction ceased after about five generations, presumably on account of temporary incompatibility due to modifications in the factors responsible for chemotropic affinity.

The size of the oogonia is controlled by the female strain, a given female strain characterized by small oogonia continuing to produce similar bodies irrespective of the male strain with which it is mated. Thus, *P. palmivora* 4, from *Borassus* [*flabellifer*: ibid., ix, p. 89], when mated with any of the male strains produces oogonia measuring 35 μ, whereas those of *P. parasitica* 14, paired with the same male strains, average only 28 μ. *P. palmivora* 1, from coco-nut, forms countless oogonia when mated with any of the opposite strains, whereas *P. parasitica* 2, paired with the same male strains, gives rise to few oogonia.

It was shown by experiments [the results of which are tabulated] that no correlation exists between sexuality and the growth of the various *Phytophthora* strains in the presence of minute quantities of crystal violet and malachite green [ibid., ix, pp. 327, 809]. It was further ascertained that, generally speaking, strains of the *P. parasitica* type are more resistant to dyes than those of the *P. faberi* or *P. palmivora* group.

HOPKINS (J. C. F.). **Diseases of Tobacco in Southern Rhodesia.**—93 pp., 17 pl. (6 col.), 14 figs., Min. Agric. & Lands, Southern Rhodesia, 1931.

This useful and well illustrated handbook is primarily intended for the guidance of practical growers of tobacco in Southern Rhodesia, and contains a wealth of information, for the most part couched in popular language, regarding the correct laying-out and conduct of tobacco seed-beds and plantations. Popular accounts are also given of the parasitic and physiological diseases that attack this crop, with particular reference to those that occur and have been studied in South Africa, including recommendations for their control. Notes on some of the organisms involved in the diseases, of technical interest to mycologists, are included in an appendix; of these the following may be noticed.

The leaf spotting which until recently was attributed to *Phyllosticta nicotiana* alone [*R.A.M.*, vi, p. 715], has now been differentiated into two separate forms, namely, shot hole caused by *P. nicotiana*, and leaf blotch caused by *P. tabaci*. In the field the former is characterized by minute white spots that gradually increase up to a diameter of an eighth of an inch, when the diseased tissue dries up and falls out; in late stages the whole of the leaf blade may be thus practically destroyed, leaving only a skeleton of the larger veins with some white tissue still adhering to them, in which the pycnidia of the fungus are embedded. The disease is frequent in seed-beds on chlorotic plants (this constituting a serious source of field infection), on which the usual symptoms are white blotches up to $\frac{1}{2}$ inch in diameter, but without the shot hole effect. Leaf blotch (*P. tabaci*) first appears on the upper surface of the leaf as small, light brown spots about $\frac{1}{8}$ inch. in diameter, enlarging to form roughly circular, slightly zonate blotches up to 3 inches across; in severe cases most of the leaf tissues may be killed and reduced

to a mass of shreds. This form occurs more or less severely in one district, but is not generally considered to be of great importance in Southern Rhodesia.

Of the two species of *Alternaria* associated with leaf spots which have shown to be parasitic, the one referred to *A. tabacina* has been dealt with in some detail in a recent paper of the author [ibid., xi, p. 134], the only additional information being that this fungus exhibits considerable polymorphism according to the substratum. The other species is placed in the *A. solani* group and referred to *A. longipes* [ibid., x, p. 763], in spite of a discrepancy in spore measurements (40 to 50 by 15 to 20 for Ellis's and Everhart's fungus, as against 90 to 275 by 9 to 20 for the Rhodesian fungus), as it is possible that the long stipe mentioned by earlier authors was really the beak. A comparison with *A. macrospora* from cotton in Nigeria and Uganda showed that it is not identical with the latter. The disease caused by *A. longipes* on tobacco is named early blight, because of its similarity in symptoms with this disease in the potato.

CALDWELL (J.). **The physiology of virus diseases in plants. II. Further studies on the movement of mosaic in the Tomato plant.**—*Ann. of Appl. Biol.*, xviii, 3, pp. 279–298, 4 pl., 1 fig., 1931.

The results of further experiments [a full description and discussion of which are given] on the translocation of the aucuba mosaic virus in the tomato plant [*R.A.M.*, x, p. 66] (with which that of tobacco mosaic was shown to be similar in tobacco and tomato plants) indicated that the filtered infective juice was readily absorbed at the cut end of a petiole and thence passed into the xylem vessels of the main stem. When the petiole stump was left attached to the experimental plant, aucuba mosaic symptoms developed in the usual manner; on the other hand, when the stump was removed under aseptic conditions within 48 hours of inoculation, no symptoms followed. That the virus was present in the vessels was shown by the fact that mosaic appeared after the normal period of incubation when the leaves above the removed petiole was crushed so as to rupture the bundles, even in the plants in which the intermediate portion of the stem had been killed by steaming [loc. cit.]. The active agent was evidently carried mechanically in the xylem vessels across the dead tissue. Crushing of the leaves above the steamed stem portion did not, however, induce the appearance of the symptoms in plants which had been subjected to leaf inoculation by rubbing with wool soaked in virus juice below the dead internode. The liquid exuding from the hydathodes of infected plants was shown not to contain the active agent.

These experiments are interpreted to show that normally the virus agent does not enter the water stream of the plants, but if introduced experimentally, it is carried round in the xylem vessels, from which it cannot, however, pass into the ground tissues and phloem unless the vessels are mechanically injured, e.g., by crushing. All the indications are that the agent cannot enter an unbroken cell, nor move through or out of dead cells; because of the

latter fact great care must be taken to ensure that aucuba mosaic inocula tested in artificial infection experiments should be free from any trace of substances toxic to the host cells.

Inside the ground and meristematic tissues there was evidence that the active agent travels along the protoplasmic strands both upward and downward, the rate of progress being slightly greater in the first than in the second direction, probably owing to the greater metabolic activity in the upper portion of the plant. The removal of large portions of the vascular tissue from the stems did not appear to delay the movement of the agent up the stem. Darkness did not appear to have any effect on the multiplication of the virus in the tissues; too prolonged exposure in darkness, however, caused the permanent wilting of both diseased and healthy tomato plants, brought about, it is believed, by physiological causes.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iii, 4, pp. 164, 183–188, 193, 1931.

Germany. An enactment of 28th June, 1931, prescribes the measures to be taken for the control of elm disease (*Graphium ulmi*) in Prussia, which are practically identical with those in force in Bremen [*R.A.M.*, x, p. 752]. Similar regulations were adopted in Lower Silesia and Schleswig-Holstein on 11th and 21st July, 1931, respectively.

Union of South Africa. By Proclamation No. 173 of 21st April, 1931, the provisions of Act 6 of 1924 (amending the Agricultural Pests Act 11 of 1911) [ibid., iii, p. 752] are extended to include the seeds of elm (all species of *Ulmus*), lucerne, tea, and tomato.

Britton (W. E.). **Quarantine regulations affecting shipments of Connecticut nursery stock, 1931.**—*Connecticut Agric. Exper. Stat. Circ.* 79, pp. 55–62, 5 maps, 1931.

The State of Connecticut has legally established control areas round twelve nurseries in order that five-leafed pines may be grown in areas free from blister rust [*Cronartium ribicola*: *R.A.M.*, x, p. 352; xi, p. 143]. Under the revised regulations of Federal Quarantine No. 63 yellow flowering currants (*Ribes aureum* and *R. odoratum*) may not be shipped into New York State or Rhode Island. No shipments of black currant (*R. nigrum*) are permitted. Red, white, and mountain (*R. alpinum*) currants and gooseberries may be moved between different States or from place to place in Connecticut only between 20th September and 15th May, provided that (*a*) if shipped in autumn, the plants shall be defoliated; (*b*) if in spring, they shall be free from the preceding year's leaves; and (*c*) before movement they shall be immersed (except the roots) in lime-sulphur (1 in 8, 32° Baumé).

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JOHNSON (E. M.) & VALLEAU (W. D.). **Blackleg of Tobacco seedlings.**—*Phytopath.*, xxi, 10, pp. 973–978, 5 figs., 1931.

In May, 1930, Burley tobacco seedlings at the transplanting stage were found in Kentucky to be suffering from a rot starting at or near soil level and extending up the stem. The rotted areas were brown or almost black, sometimes soft, and the stems were often split longitudinally, the basal leaves being partially or entirely decayed. Numerous actively motile bacteria occurred in the rotted parts and were readily isolated. Inoculations on Turkish and Burley tobacco in the greenhouse and field gave positive results. Soft rot of potatoes and carrots was also produced by the tobacco blackleg pathogen, comparative studies of which with *Bacillus aroideae* and *B. carotovorus* indicate a close relationship with the former, with which it is considered to be probably identical.

ANGELL (H. R.) & HILL (A. V.). **Blue mould of Tobacco: longevity of conidia.**—*Journ. Australia Council Sci. & Indus. Res.*, iv, 3, pp. 181–184, 1931.

Experiments [which are described and the results of which are tabulated and discussed] showed that the conidia of the *Peronospora* causing downy mildew or blue mould of tobacco [*R.A.M.*, xi, p. 198] remained viable not only for five weeks over fused calcium chloride in desiccators but also for two months either in the cool, moist air of a refrigerator or buried in cool, dry soil.

As conditions may exist in nature which allow of similarly long life to the conidia of this organism, it is considered that the disease may be capable of spreading over larger areas than has hitherto been thought likely. Such a possibility emphasizes the necessity of destroying diseased plants, and at the end of the season ploughing under the remains of the crop, keeping the field free from volunteer plants in the spring before the new crop is planted.

MCCLEAN (A. P. D.). **Bunchy top disease of the Tomato.**—*Farming in South Africa*, vi, 67, pp. 275–276, 280, 5 figs., 1931.

Bunchy top disease of tomatoes has been observed since 1926 in South Africa, causing extreme reduction in the size of the plants, which reach a height of only 1 to 2 ft. The leaves are abnormally

small and unusually dark in colour, the new ones being closely grouped at the top of the plant; the affected foliage is further characterized by downward curling of the margins and an uneven surface. The older leaves at the base of the plant die off from fungous diseases, e.g., leaf spot [*Septoria lycopersici*]. In advanced stages of bunchy top only a few thin, erect stems with small leaves are left. Affected tomato plants bear no fruit of any commercial value.

The tomato bunchy top virus is believed to be similar to that of tobacco mosaic, and is also transmissible by handling, use of infected tools, and the like. No evidence has been obtained of seed or soil transmission. Diseased plants in old fields, and possibly weeds, seem to constitute the primary sources of infection; Cape gooseberries [*Physalis peruviana*] are very susceptible. Early cases of bunchy top may be observed five weeks after transplanting. Occasionally the disease occurs in epidemic form, but usually its incidence is low. In addition to cultural measures and the roguing of diseased plants, the use of an insecticide, such as lime-sulphur and lead arsenate, in the seed-bed is recommended.

SHAPOVALOV (M.). **Graft transmissions of curly top in Tomatoes (Tomato yellows.)**—Abs. in *Phytopath.*, xxi, 10, pp. 998–999, 1931.

Young, healthy tomato seedlings, grown in pots in the greenhouse at Berkeley, California, were inoculated with yellows [*R.A.M.*, x, p. 415] by a week's exposure of one leaf of each plant to viruliferous beet leafhoppers, *Eutettix tenella*. The inoculated plants were then grafted with healthy plants of the same age, and some were shaded. On an average a higher number of successful transmissions was obtained by inoculation with viruliferous insects than grafting, except when this operation was performed immediately after the removal of the leafhoppers. The exposure of inoculated and grafted plants to four or six hours' artificial illumination by four 500-watt Mazda lamps during the evening accelerated the rate of disease development, which was retarded by muslin shading.

FENNER (L. M.). **Bacterial canker of Tomato and its distribution with the seed from infected fruit.**—*Journ. Econ. Entom.*, xxiv, 2, pp. 544–547, 1931.

After a brief description of the symptoms and notes on the economic importance of bacterial canker of tomatoes (*Aplanobacter michiganense*) [*R.A.M.*, x, p. 415], the writer gives a short account of an experiment conducted in 1930 to determine the extent of seed contamination within a given fruit of a plant with systemic infection.

Tomato seed from cankered and healthy plants was saved from Mississippi fields. A part of the fruit was washed to remove the débris and the remainder first washed and then immersed for five minutes in 1 in 1,000 bichloride of mercury for the purpose of eliminating surface contamination. The seeds were removed aseptically with a knife and spatula. An examination of the external and internal appearance of the seed of 68 fruits of

Mississippi plants showed less than 2 per cent. infection, though 75 per cent. of the fruits showed some infection, while seed produced elsewhere showed a trace to above 1 per cent. In one case two fruits from an apparently healthy plant in a cankered field yielded infected seed. The actual contamination in these seed lots from various sources is estimated at 10 per cent. and above, and it is pointed out that the fermentation method of saving tomato seed favours contamination. The preliminary experiments show that a small amount of infected seed may give rise to a fairly high percentage of diseased plants, while contaminated seed usually results in a very high proportion of infected plants.

SMALL (T.). **Experiments on the control of Tomato leaf mould (Cladosporium fulvum) by fungicides and fumigants.**—*Ann. of Appl. Biol.*, xviii, 3, pp. 305–312, 1931.

The results of laboratory and greenhouse experiments [brief details of which are given] on the control of tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, x, p. 630] at the Experiment and Research Station, Cheshunt, showed that most of the fungicidal sprays tested were more efficient when agral I was added as a spreader instead of saponin. Effective control was afforded by 0·25 per cent. salicylanilide, 0·50 per cent. ammonium copper carbonate, and 0·40 per cent. colloidal sulphur A sprays, of which the two last-named were shown in preliminary trials to be the most suitable under commercial glasshouse conditions. Ammonium copper carbonate also gave indications of being a useful spray on already diseased tomato crops. Among the 27 fumigants tested, ethylene dibromide, quinone, and thymol controlled the leaf mould in laboratory experiments, and quinone was effective in trials in a small glasshouse, but further work is required to determine whether this substance is suitable to fumigation in large glasshouses. Fumigations with Campbell's sulphur vaporizer [ibid., i, p. 437] gave protection against infection only to the upper side of the leaves, and failed to kill the spores on the under side of infected leaves. While the leaf surface on which infection occurs under natural conditions has not yet been established, inoculation experiments indicate that either side of the tomato leaf may be infected. A further series of experiments showed large empty glasshouses may be practically freed from infection by *C. fulvum* by fumigations with formaldehyde or sulphur dioxide.

HUBERT (E. E.). **An outline of forest pathology.**—543 pp., 9 pl., 150 figs., 16 diags., 2 maps, New York, J. Wiley & Sons, Inc., London, Chapman & Hall, Ltd., 1931.

In this very useful work the author aims at a presentation of the fundamental principles and practices underlying the pathology of wood products as well as that of growing trees, emphasis being laid throughout on North American conditions. The subject is considered under the following aspects: a brief historical survey of the science of forest pathology; classification of tree diseases; the influencing factors (including heredity and predisposition); the relative importance of tree diseases; symptoms and diagnosis; non-organic or physiogenic, organic, semi-parasitic, and sapro-

phytic agencies; the properties of decayed wood; the relative resistance of wood to decay; and control methods. Extensive observations are made on the various classes of timber rots, both in the living tree [*R.A.M.*, vi, p. 450] and in felled and structural timber. A large number of the illustrations are original.

Buisman (Christine). **Three species of Botryodiplodia (Sacc.) on Elm trees in the United States.**—*Journ. Arnold Arboretum*, xii, 4, pp. 289–296, 2 pl., 1 fig., 1931.

Three different species of *Sphaeropsis* or *Botryodiplodia* (the latter name being preferred by the writer) have been found on elm twigs in New England, viz., *B. malorum* [*Physalospora cydoniae*] and *B. ulmicola* on *Ulmus americana* and *B. hypodermia* on *U. foliacea* [var.] *suberosa*.

Pycnidia of *P. cydoniae* were found on two-year-old and older twigs, sometimes in association with *Phomopsis* and *Cytospora* spp. The fungus may form a canker extending over the whole twig or only along one side. The infected twig assumes a brown colour and brown streaks may extend for some distance into the healthy wood. The twigs above a cankered area often lose their leaves and die. Apple fruits inoculated with monospore cultures of the fungus developed typical mummies. The pycnospores from elm and apple twigs, respectively (50 each), were 21 to 24 by 10 to 12 and 20 to 23 by 10·5 to 13 μ, the corresponding figures from cultures being 23 to 26 by 10 to 12 and 22 to 25 by 9 to 11 μ. The relative numbers of continuous and bicellular spores varied in different isolations. Cross-inoculation experiments on elm and apple did not result in canker formation, so that the fungus is evidently not a virulent parasite and may possibly only attack trees previously weakened by some other cause.

B. ulmicola (Ell. & Ev.) nov. comb. [ibid., x, p. 633, as *Sphaeropsis*] was also isolated from twig cankers on *U. americana*, and spores were produced in subsequent cultures on sterilized elm twigs. Both hyaline, unicellular, and dark brown, bicellular spores occurred in the same culture, irrespective of the original colour of the spores used. The average dimensions of the hyaline spores were 27 to 30 by 14 to 15 μ and those of the brown ones 25 to 30 by 12 to 15 μ. The fungus was inoculated into young elms, in which, however, it failed to progress beyond the site of inoculation.

Petrak and Sydow (Die Gattung der Pyrenomyceten, Sphaeropsideen and Melanconieen, 1927) include *S. ulmicola* under *B. hypodermia* (Sacc.) Petr. et Syd., but the fungus isolated from the Wisconsin twigs agrees closely with Ellis and Everhart's description of *S. ulmicola*, whereas Petrak's and Sydow's diagnosis of *B. hypodermia* corresponds with the third species found by the writer on elm twigs, as described in the next paragraph.

B. hypodermia, found only on dead twigs of *U. foliacea* [var.] *suberosa*, produced almost exclusively hyaline spores, but a few brown, bicellular ones were detected both in nature and in culture. The dimensions of the hyaline spores on three twigs were 29 to 34 by 15 to 18, 26·5 to 30 by 16·5 to 20, and 26 to 29 by 15·5 to 18 μ, respectively; while in three monospore cultures they measured

29 to 34 by 16 to 19, 34 to 37 by 16 to 17, and 32 to 37 by 16 to 19 μ, respectively. The brown spores from a twig measured 26 to 31 by 15 to 18 μ and from three monospore cultures 35 to 39 by 15·5 to 17·5, 32 to 37 by 15 to 17, and 27 to 32 by 15 to 18 μ, respectively. Some degree of success was obtained in inoculation experiments with *B. hypodermia* both on elm saplings and on apple fruit, causing typical cankers on the former and a deeply sunken rot on the latter.

MAY (C.). **A new Elm disease.**—*Science*, N.S., lxxiv, 1922, p. 437, 1931.

From slightly over 10 per cent. of some 300 specimens of diseased elms from Iowa, Missouri, New York, Washington, D.C., and various parts of Ohio, a species of *Cephalosporium* was isolated in 1930 characterized on potato dextrose agar by a light brown mycelium and hyaline, elliptical or irregular conidia measuring 4·5 by 1·9 μ (average of 50) and occasionally occurring in loose groups on a small head borne on the end of a short conidiophore. Some of the trees died during the summer of 1930, while others lost part of their tops.

In the spring of 1931, 14 young elms were inoculated with the fungus, and about a month later seven of the trees began to show a drooping and wilting of the leaves, generally preceded or accompanied by a distinct yellowing and followed by defoliation, though some of the leaves turned brown and remained on the twigs for over a month. The diseased twigs and branches died, as well as the main trunk above the point of inoculation, and some trees also showed a blackening of the bark. Most of the branches below the point of inoculation remained healthy.

A brown discoloration of the cambium and current growth of sapwood was apparent in the diseased branches. The staining was more uniform and rather more diffuse than that occurring in cases of infection by *Graphium ulmi* or *Verticillium* [*albo-atrum*: ibid., x, p. 633]. The *Cephalosporium* was reisolated from the inoculated diseased trees but not from those that developed no symptoms after inoculation.

DEMAREE (J. B.). **Diseases of Pecans in the southern States.**—*U.S. Dept. of Agric. Farmers' Bull.* 1672, 27 pp., 21 figs., 1931.

This bulletin (superseding No. 1129 of the same series) presents in a popular form the available information on the following pecan diseases and their control in the southern United States: scab (*Cladosporium effusum*), leaf blotch (*Mycosphaerella dendroides*), brown leaf spot (*Cercospora fusca*), nursery blight (*Phyllosticta caryae*) [*R.A.M.*, x, p. 646], crown gall (*Bacterium tumefaciens*), powdery mildew (*Microsphaera alni*) [ibid., iii, p. 381], western sooty spot (*Gloeosporium caryae* var. *curvisporum*), leaf spot caused by *Gnomonia* sp., downy spot (*Cercosporella caryigena*) [ibid., x, p. 646], wood rots, rosette [ibid., ii, p. 135], sand burn, little leaf, winter injury, and oedema.

M. dendroides produces brown or greenish-brown, later almost black spots, often uniting to form large irregular blotches, on the

under sides of the leaves. The fungus is first observed in late June or early July on the older leaflets and may gradually extend until all the mature leaves are spotted or killed, defoliation spreading upwards until the beginning of November. Blotch is often the most prevalent foliage disease of budded or grafted nursery trees and is usually responsible for premature leaf shedding. *C. fusca* produces reddish-brown, later greyish, zonate, circular to irregular spots which frequently result in total defoliation, the Stuart variety being particularly susceptible while Moneymaker is also liable to severe injury. Both leaf blotch and brown leaf spot may be controlled by two applications or 3–4–50 Bordeaux mixture or three of copper lime dust (20–80).

DENNIS (R. W. G.). **The black canker of Willows.**—*Trans. Brit. Mycol. Soc.*, xvi, 1, pp. 76–84, 1931.

This is a summarized account of the investigation in 1929–30 at the University of Bristol of the black canker disease of basket willows (*Salix* spp.) in the west of England. Parallel inoculation experiments [details of which are given] with *Physalospora miyabeana* [*R.A.M.*, xi, p. 139] originating from local isolations, and with cultures of *Fusicladium saliciperdum* [*Venturia chlorospora*: ibid., xi, p. 161] obtained from Nattrass, and from Clinton and McCormick (since no fructifications of this fungus could be found locally) on young stems of *S. americana*, young leaves and just expanding buds of *S. vitellina*, *S. americana*, and *S. purpurea*, showed that under the conditions of the tests, *F. saliciperdum* consistently gave negative results, while *P. miyabeana* gave positive infections in every case. These results are considered to indicate that in western England *P. miyabeana* alone is responsible for the disease.

Berättelse över forstförvaltningens verksamhet år 1928. [Report on the work of forest administration in the year 1928.]—*Finlands Officiella Statistik*, Helsingfors, 100 pp., 1931.

In a brief note on the insect and fungus pests of forest trees observed in Finland during 1928, cone rust (*Chrysomyxa pyrolae*) of Norway spruce [*Picea excelsa*: *R.A.M.*, ix, p. 420] is stated to have spread widely and caused much damage in the western districts. In the north and east of the country minor injuries were inflicted on the same host by the snow cover fungus [*Phacidium infestans*: ibid., xi, p. 136].

NELSON (R. M.). **Decay in Loblolly Pine on the Atlantic coastal plain.** [*ex* Garver (R. D.), Cuno (J. B.), Korstian (C. F.), and MacKinney (A. L.). Selective logging in the Loblolly Pine-hardwood forests of Middle Atlantic coastal plain with special reference to Virginia.]—*Virginia For. Serv. Publ.* 43, pp. 58–59, 1931.

A study was made of decay in 867 trees [of *Pinus taeda*] in connexion with a forest utilization study in eastern Virginia. The trees were mostly between 50 and 80 years of age. Ninety-five (11 per cent.) of the trees were found to have red heart due to

Trametes pini. The percentage of trees infected increased from 5 in the 40 to 90 year age class, to 19, 60, and 72, respectively, in the 90 to 140, 140 to 190, and 190 to 230 year age classes. Sporophore production was almost entirely limited to trees over 18 inches in diameter, and no other reliable external symptom of decay was discovered. In the 15 trees that bore sporophores, the length of bole infected averaged 50 ft. Figures are given for the deduction in log scale for decay and for the actual loss in lumber sawed from infected logs, the former being found to be considerably greater than the latter. Infections by *T. pini* originated almost entirely in the upper bole, and the decay caused by other fungi was negligible.

GUINIER (P.). **Le rouge des aiguilles du Douglas.** [Needle fall of Douglas Fir.]—*Bull. Soc. Centr. Forest. Belgique*, xxxviii, 8, pp. 352–357, 3 pl., 1931.

After briefly describing the symptoms and distribution of needle fall of Douglas fir (*Rhabdocline pseudotsugae*) [*R.A.M.*, xi, p. 142] the author states that the disease apparently remains unrecorded in Belgium, Switzerland, Czecho-Slovakia, and France.

Strict measures to prohibit the entry of diseased material have been taken by France [ibid., x, p. 480] and Germany [ibid., ix, p. 816], but even if the disease should appear in France, the author considers that it will probably remain unimportant, as the highly resistant green leaf Douglas [*Pseudotsuga taxifolia*] is much more widely grown there than the susceptible blue Douglas [*P. glauca*], the plantations are not dense, and the climate is too dry to favour the disease.

BARNETT (EUPHEMIA C.). **Some fungi on Bracken.**—*Trans. Brit. Mycol. Soc.*, xvi, 1, pp. 85–86, 1931.

In this brief note the author states that of two pycnidial forms (A and B) commonly found on bracken [*Pteridium aquilinum*] affected with the dying back disease in Scotland [*R.A.M.*, viii, p. 412], the first was shown in cultural tests to be a stage in the life-history of *Rhopographus filicinus*, single spore cultures of which produced similar pycnidia either completely embedded in a black stroma or else superficial and provided with a definite black wall. The spores contained in the natural pycnidia and in those formed in culture were also similar. The second form, which is of constant occurrence on all the aerial and underground parts of diseased plants, developed from perithecia of the *Mycosphaerella* type on bracken which apparently bore no other organism and was kept in the laboratory. The perithecia were embedded in the host tissues and were provided with a hard, black wall and a distinct ostiole; they averaged 140 μ in diameter. The ascospores are narrowly oval, two-celled, tapering at both ends, sometimes slightly curved; no completely mature spores were present, but those that could be measured were about 35 by 4 μ. The pycnidia are roundish, ostiolate, brown to black, and contain hyaline, oval, curved pycnospores, 20 to 30 by 4 to 6 μ, continuous when young and 1- to 3-septate when older.

Report of the Provisional Forestry Board for the year ended 30th June, 1930.—Queensland Forest Service, Brisbane, 90 pp., 17 pl., 1930.

In a note on p. 39 of this report it is stated that the losses due to blue stain [*Ceratostomella* spp.: *R.A.M.*, x, p. 143 *et passim*] in pine stocks at country sawmills in Queensland have recently become so serious that special investigations have been carried out with a view to remedying this condition. At Brisbane it was found that stocks of pine seasoned in the open air are little affected by blue stain. At Maryborough many of the logs arriving at the mills were found to have already become contaminated in transit, while in other cases infection developed on the exposed timber if sawing was delayed. Timber sawn from clean logs showed no tendency to turn blue in the exposed seasoning stacks, many of which were low and built on swampy ground. At other mills blue stain was in evidence wherever rain had penetrated the seasoning stacks, while the dry portions remained clean. The fact that blueing occurs in open air stacks at some mills and not at others is attributed to the position of the former in the 'cloud belt' (over 1,000 ft. above sea level), where a greater number of wet or dull days is experienced, although the actual rainfall in the lower towns is higher. In the latter situations, however, the more frequent sunshine keeps the stacks reasonably dry. The moisture content of boards from the mountain range was found to be considerably higher than that of corresponding material from the plain.

It was recommended that the delay between felling and sawing should be reduced to a minimum. Where delay is unavoidable the piles should be covered. Sawn timber should be kept in covered stacks in the open air.

DANIELS (A. S.). **A dish for toxicity tests.**—*Indus. & Engin. Chem.* (*Analyt. Ed.*), iii, 4, p. 358, 1931.

The writer has found Stender dishes superior to both Petri dishes and Erlenmeyer flasks in the testing of wood preservatives. After plating and inoculating the cultures in Petri dishes in the ordinary way, a sterile 100 mm. Stender dish is inverted on the table. The bottom is raised a few inches and the prepared Petri dish slid on to the Stender dish cover. The cover of the Petri dish is removed, the ground groove in the Stender dish cover filled with melted, hard vaseline, and the Stender dish gently lowered and fitted back into the vaseline-filled groove of the cover. Cultures thus prepared are convenient to handle and they effectively prevent the volatilization of any appreciable portion of the substance under test.

FALCK (R.) & KAMESAM (S.). **Ein neues, allgemein verwendbares Holzschutzmittel.** [A new timber preservative adapted for general use.]—*Chem. Zeit.*, lv, 87, pp. 837–838, 1931.

The writers' experiments, conducted at the Mycological Institute of the College of Forestry, Hann.-Münden, in the development of a timber preservative combining a high degree of toxicity to wood-destroying fungi and insects with non-corrosive properties and

resistance to leaching out, demonstrated the efficacy of a mixture of equal parts of arsenic pentoxide and potassium or sodium bichromate. Comparative tests with this compound over 30 standard wood preservatives are stated to have shown the superiority of the first-named in the above-mentioned aspects. The arsenic pentoxide mixture possesses the further advantages of cheapness, simplicity of preparation, and facility of transport and manipulation.

ANDERSON (B. A.). **The toxicity of water-soluble extractives of Western Yellow Pine to Lenzites sepiaria.**—*Phytopath.*, xxi, 10, pp. 927–940, 1 fig., 1 graph, 1931.

A tabulated account is given of the writer's investigations on the toxicity to *Lenzites sepiaria* of water-soluble substances extracted from kiln-dried and air-seasoned heartwood and sapwood of western yellow pine (*Pinus ponderosa*) [*R.A.M.*, ii, p. 51]. The extracts were evaporated down to 1 c.c. per gm. of wood-flour. The fungus was grown on varying concentrations of wood-flour extract and malt agar, and on 1·5 per cent. malt agar alone for control purposes. The air-seasoned heartwood extract soaked for three hours in boiling water was most toxic to the organism, the growth of which was totally inhibited by the 25, 50, and 75 per cent. concentrations, and showed 41 per cent. retardation on a 10 per cent. strength. The lowest degree of toxicity was exercised by the cold-water treated, kiln-dried sapwood, indicating that a loss of certain volatile materials destructive to the fungus results from the temperatures (approximating 180° F.) at which kiln-drying is carried out.

FRON (G.). **Au sujet du Merulius lacrymans ou champignon des maisons.** [On the subject of *Merulius lacrymans* or house fungus.]—*Journ. d'Agric. Prat.*, N.S., xlv, 41, pp. 300–301, 1931.

Replying to a correspondent, the writer gives a brief account in popular terms of the symptoms, mode of infection, and control of the dry rot fungus (*Merulius lacrymans*).

The development of the fungus is favoured by the use of insufficiently dried wood (with a moisture content exceeding 15 per cent.), defective ventilation, and the employment of alkaline substances, such as clinkers, cinders, or sea sand to fill the spaces between joists and beams.

The efficacy of carbolineum and similar coal-tar products in the control of *M. lacrymans* is regarded as indisputable, but the use of such preparations is not always practicable on account of their unpleasant odour and liability to stain the wood. Good results have been obtained with etymolos, raco, and mykanthine (mixtures of phenol and sodium fluoride), while the writer specially recommends mycothanaton, which may be made at home according to the following formula: 750 gm. calcium chloride, 1,500 gm. sodium sulphate, 2 l. hydrochloric acid, 66 gm. bichloride of mercury, and 57 l. water.

HUMPHREY (C. J.). **Decay of wood in automobiles in the tropics.**—*Philipp. Journ. of Sci.*, xlvi, 2, pp. 189–197, 2 pl., 1931.

Very serious depreciation is stated to occur in motor cars in the Philippine Islands as a result of decay of the wood by *Lenzites striata* [*R.A.M.*, v, p. 397], *Polyporus* [*Polystictus*] *sanguineus*, and *Trametes versatilis* [ibid., x, p. 635]. Some general observations are made on the conditions favouring attack by these organisms, and on the control of the latter by the application of standard wood preservatives and the use of durable native timbers, e.g., *Dipterocarpus grandiflorus*, for construction and replacement instead of the relatively perishable American woods now commonly employed for these purposes.

LINFORD (M. B.). **Streak, a virus disease of Peas transmitted by Thrips tabaci.**—Abs. in *Phytopath.*, xxi, 10, p. 999, 1931.

Canning peas (*Pisum sativum*) were observed in 1928 to show a streaking and spotted brown necrosis of pods, stems, and leaves, the disease being apparently widespread in the United States. The pods may show necrotic circular pitting or they may collapse altogether; on the leaves the injury may begin with spotting or brown vein streaking extending down the stems and associated with phloem necrosis. No micro-organisms were found in connexion with this disease. During investigations of pineapple yellow spot in Hawaii [*R.A.M.*, xi, p. 191], infective thrips (*Thrips tabaci*) were transferred to peas from diseased *Emilia sagittata* [*E. flammea*], with the result that the typical streak symptoms developed in 21 out of 45 plants. Thrips reared on infected peas reproduced the streak symptoms on the host and those of yellow spot on pineapple The incubation period in peas lasts about 12 to 20 days. Streak caused by the yellow spot virus was found in market-gardens near Honolulu.

HARTER (L. L.) & ZAUMEYER (W. J.). **Pythium butleri—the cause of a Bean wilt.**—*Phytopath.*, xxi, 10, pp. 991–994, 1931.

This is an expanded account of the writers' investigations on the occurrence of bean (*Phaseolus vulgaris*) wilt caused by *Pythium butleri* in Colorado and Virginia [*R.A.M.*, x, p. 423]. *Pythium* has long been known as the cause of bean root rots and damping-off of seedlings, but this is believed to be the first record of its pathogenicity to almost mature plants in the field. During 1930 the disease was observed in five large plantings in Colorado, causing a reduction in stand of 10 to 12 per cent., and also in Virginia. In both localities the season was excessively dry with high temperatures, but the relative humidity during the night was close to saturation. The disease occurred with equal severity both on irrigated and non-irrigated soil.

The symptoms developing in seedlings and young plants inoculated through wounds at the cotyledonary node with the mycelium of *P. butleri* were typical of those observed in the field. Wilting did not occur at the ordinary greenhouse temperatures of about 21° during the day and 16° at night, but it developed in three to four days in plants placed in an infection chamber at 30° with an almost saturated atmosphere. In a further test, two sets of nine plants

each were inoculated at soil level, one set being surrounded by sphagnum to keep the stems moist and the other left uncovered. No infection developed at ordinary greenhouse temperatures, but the plants wilted in three or four days at 36°, indicating that high temperatures are of greater importance than high humidity in furthering infection.

MACKIE (W. W.) & ESAU (KATHERINE). **A preliminary report on resistance to curly top of Sugar Beets in Bean hybrids and varieties.**—Abs. in *Phytopath.*, xxi, 10, p. 997, 1931.

Beans have been observed to be liable to infection by curly top of sugar beet since 1919 [*R.A.M.*, ix, p. 229]. In a test in which short rows of bean hybrids and varieties were infested, at the fourth leaf stage, with infective nymphs of *Eutettix tenella*, 51·6 of the white varieties of *Phaseolus vulgaris* were destroyed, the corresponding figures for the pink and mottled ones being 29 and 30, respectively. The one variety of *P. multiflorus* tested contracted 100 per cent. slight injury, while *P. lunatus* [var.] *sieva* showed 17 per cent. severe damage. In the cross between the mosaic-resistant Robust, a white pea bean, and the curly top-resistant California Pink, a number of fixed resistant hybrids were secured in both pink and white beans, indicating only a partial correlation between pink coloration and resistance.

NATTRASS (R. M.). **The occurrence of the 'white rot' of the Onion (Sclerotium cepivorum, Berk.) in Egypt.**—*Min. of Agric. Egypt. Tech. & Sci. Service (Plant Protect. Sect.) Bull.* 107, 9 pp., 9 pl., 1931.

White rot of onions (*Sclerotium cepivorum*) [*R.A.M.*, x, p. 499] was detected in Upper Egypt during the season 1930–1. So far it appears to be confined to a very small area, and the careful inspection at Alexandria of large quantities of onions destined for export failed to reveal the presence of the fungus. However, in view of the extent and value of the export trade in onions, considerable potential importance attaches to the discovery of this disease, the eradication of which presents great difficulties.

Comparative studies were made on various media of the Egyptian strain of *S. cepivorum* and one procured from the Centraalbureau voor Schimmelcultures, Baarn. The optimum temperature for the growth of both strains was 22° to 24° C. (minimum 16°, maximum 35°). At all temperatures and media tested the Dutch strain made more vigorous growth than the Egyptian one, producing a denser, more floccose type of mycelium and forming micro-sclerotia up to 16 days later.

White rot becomes apparent in Upper Egypt during February and March, when the average soil temperatures for fallow land 5 cm. below the surface are 18·7° and 22·5° C., respectively. After March the soil temperature rises above 30° and may reach 60° on the surface. The control of the disease should be based on preventive cultural measures, special attention being paid to the use of seedling plants raised on healthy soil. Once infection has become established, onions should not be grown again on the diseased area for at least eight years. The following legislative

measures are also contemplated: inspection during grading, prohibition of export from scheduled areas, and periodical Government inspections of the grading yards.

HAMMARLUND (C.). **Kleinere mycologische Notizen II. Eine Riesenform von Peronospora brassicae Gäumann [= P. parasitica (Fries) Tulasne] auf Raphanus sativus f. radicula.** [Shorter mycological notices II. A giant form of *Peronospora brassicae* Gäumann [= *P. parasitica* (Fries) Tulasne] on *Raphanus sativus* f. *radicula.*]—*Bot. Notiser, 1931,* 5, pp. 392–393, 1931.

In the south of Sweden *Peronospora brassicae* (*P. parasitica*) [*R.A.M.*, viii, p. 290]; is widely distributed on the leaves, petioles, stems, and flowers of wild and cultivated radishes (*Raphanus raphanistrum*, *R. sativus* f. *radicula*, and *R. sativus* f. *nigra*), as well as on several other plants. It is occasionally found also on the portions of radish tubers protruding above soil level, in which case the conidiophores assume abnormally large dimensions (average height of 100 individuals, $773 \pm 6{\cdot}1\ \mu$, maximum $1{,}070\ \mu$, minimum $540\ \mu$, average thickness $19{\cdot}7 \pm 0{\cdot}4\ \mu$, maximum $21{\cdot}6\ \mu$, minimum $16{\cdot}2\ \mu$). The conidia were also unusually large (average of 100, $31{\cdot}2 \pm 0{\cdot}5$ by $22{\cdot}6 \pm 0{\cdot}1\ \mu$, maximum $35{\cdot}1$ by $24{\cdot}3\ \mu$, minimum 27 by $21{\cdot}6\ \mu$). On the leaves of the same plant the conidiophores measured $265 \pm 4{\cdot}2\ \mu$ in height and $11 \pm 0{\cdot}3\ \mu$ in breadth, and the conidia 25 by $21\ \mu$. The oospores on the tubers were approximately normal in appearance and size (45 by $24\ \mu$).

The phenomenon is tentatively attributed to the availability of large food supplies in the tubers.

KENDRICK (J. B.). **Seed transmission of Cowpea Fusarium wilt.** —*Phytopath.*, xxi, 10, pp. 979–983, 1 fig., 1931.

Preliminary trials [brief notes on which are given], at Davis, California, showed conclusively that the causal organism of cowpea wilt, *Fusarium tracheiphilum* [*R.A.M.*, ix, p. 360], is carried on the seed, but no evidence was obtained that it penetrates the seed coats. In tests in which plants grown from threshed seed were compared with those from hand-picked seed in which contamination during picking was avoided, a considerable percentage of the former developed wilt symptoms, which were practically absent in the latter. Cultures from carefully removed seed in young pods failed to yield the fungus even when the the latter was obtained from the interior of the pod stalk.

RAVAZ (L.). **Chronique.—Observations à faire sur le mildiou.** [Current events.—Observations on mildew that should be made.]—*Proc. Agric. et Vitic.*, xcvi, 36, pp. 225–228, 1931.

The author states that at the time when this paper appeared (early September, 1931) a severe epidemic of vine mildew [*Plasmopara viticola*] was still in progress in the rainy areas of central and western France, while in the south little, if any, damage was done by the disease. Since there was some evidence that weaker stocks, even within the same variety, are less susceptible to *P. viticola* than more vigorous plants, he asks for the communication

to him of observations by practical growers, which may support or disprove this point.

RAVAZ (L.). **Chronique.—Sécheresse. Fils de fer. Pourriture grise. Eudémis. Mildiou.** [Current events.—Drought. Wires. Grey rot. *Eudemis.* Mildew.]—*Prog. Agric. et Vitic.*, xcvi, 35, pp. 201–204, 1931.

In discussing the influence on attacks of mildew [*Plasmopara viticola*] of the method of training vines on wires or of allowing them to grow unsupported, the author points out that the former method necessitates leaving on the stocks long branches which are stretched along, and fixed to the lower wire strands, permitting the grape bunches to develop exposed to air and light. Under such conditions the grapes do not swell to excess and have a tough skin which gives them good protection against invasion by the fungus, the cause of the much dreaded grey rot of less resistant bunches. As regards the foliage, the method of growing the vines does not appear to have any marked bearing on the susceptibility of the leaves to infection with mildew in the early spring, but later in the season, the leaves of wired vines are more exposed to infection with air-borne spores than those of untrained stocks; after the harvest, however, observations show that trained vines retain their foliage free from severe mildew attacks, while that of unsupported stocks is rapidly destroyed by the fungus; this effect is attributed to the absence or short duration of morning dews on the leaves of the former, owing to their higher position above soil level.

MOREAU (L.) & VINET (E.). **Sur les traitements curatifs du mildiou.** [On the curative treatments of mildew.]—*Rev. de Vitic.*, lxxv, 1937, pp. 105–108, 1931.

This is a somewhat contracted version of the authors' paper on the inadequate fungicidal action of the yellow and orange 'héliones' [organic colouring substances: *R.A.M.*, ix, p. 327] on vine mildew [*Plasmopara viticola*], which has already been noticed [ibid., x, p. 432].

WOODFIN (J. C.). **Control of Oidium in vineries.**—*New Zealand Journ. of Agric.*, xliii, 4, p. 287, 1931.

In giving a brief account of the measures applicable in vine-houses for the control of vine *Oidium* [*Uncinula necator*] the author states that good results may be obtained by spraying the vines with a solution of permanganate of potash made with sufficient water (to which $\frac{1}{2}$ oz. of slaked lime per gallon has been added) to reduce the colour of the mixture to a light pink [cf. *R.A.M.*, viii, p. 700]. It is pointed out, however, that this spray does not act as a protective and should be supplemented by sulphur dusting.

LUTHRA (R. S. L. J. C.). **India: some fungal diseases of farm crops recently discovered in the Punjab.**—*Internat. Bull. of Plant Protect.*, v, 10, p. 188, 1931.

Mention is made of some plant diseases recently observed in the

Punjab, India, among which is the black rot of grapes due to *Guignardia bidwellii* [*R.A.M.*, x, p. 640].

ALCOCK (Mrs. N. L.) & FOISTER (C. E.). **List of fungous diseases received by the Pathological Department of the Department of Agriculture for Scotland.**—*Trans. & Proc. Bot. Soc. Edinburgh*, xxx, 4, pp. 338–350, 1931.

This is a list [arranged according to the hosts] of the diseases of crop and ornamental plants and trees which have been received since 1924 for examination by the Plant Pathology Laboratory in Edinburgh.

KERN (H.). **Hungary: new or rare cryptogamic diseases.**—*Internat. Bull. of Plant Protect.*, v, 11, pp. 200–201, 1931.

Among other new or rare bacterial and fungous diseases observed in Hungary during 1929 and 1930 the following may be mentioned: *Bacillus* [*Bacterium*] *phaseoli* on beans (*Phaseolus vulgaris*) [*R.A.M.*, viii, p. 753; ix, p. 625]; *B. sorghi* on *Sorghum halepense* var. *sudanense* [*Andropogon sorghum* var. *sudanensis*: ibid., viii, p. 753]; *Pseudomonas pisi* on peas [ibid., ix, p. 700], this being the first record for Hungary; *Cladosporium macrocarpum* on spinach; *P. spongiosa* [*Bacillus spongiosus*] on apricot [ibid., xi, p. 58]; *Sclerotinia fuckeliana* and *Botrytis cinerea* on potato [ibid., viii, p. 607; ix, p. 626]; and *S. nicotianae* on tobacco [ibid., vii, p. 546]; the three last-named diseases being new for the country.

NOBLE (R. J.). **New South Wales: plant diseases.**—*Internat. Bull. of Plant Protect.*, v, 11, pp. 202–205, 1931.

This report of the plant diseases observed in New South Wales during the year ending 30th June, 1931, contains the following among other items of interest. Root and stalk rots of maize (*Fusarium moniliforme* [*Gibberella moniliformis*] and *G. saubinetii*) were fairly prevalent, the former organism causing unusually severe damage to the cobs, being favoured by the comparatively heavy autumn and winter rains. Cob rot (*Basisporium gallarum*) [*Nigrospora sphaerica*: *R.A.M.*, x, p. 644] was recorded for the first time in the State. Rice was attacked, also for the first time in New South Wales, by *Sclerospora macrospora* [ibid., ix, p. 513].

An obscure rosette or spindle shoot of lucerne was widespread. Soy-beans were infected by *Bacterium glycineum* [ibid., vii, p. 510] and *Bact. phaseoli* [var.] *sojense* [ibid., ix, p. 359].

The most serious and widespread disease of beans [*Phaseolus vulgaris*] was the blight due to *Bact. phaseoli* [ibid., x, p. 422], which affected the Canadian Wonder variety. Mosaic [ibid., ix, p. 502 *et passim*] was also prevalent in this crop. In metropolitan areas the most severe damage to peas was caused by *Ascochyta pisi* and *A. pinodella* [ibid., xi, p. 150], while other diseases included those due to *Bact.* [*Pseudomonas*] *pisi* and *Septoria pisi* [ibid., x, p. 161].

Citrus fruits in low-lying areas showed up to 100 per cent. infection by *Phytophthora hibernalis* [ibid., x, p. 161].

HAIGH (J. C.). **Report on the work of the Mycological Division.** —*Ceylon Administration Report of the Director of Agric. for 1930*, pp. D65–D70, 1931.

A list of fungal diseases recorded for the first time in Ceylon during 1930 [cf. *R.A.M.*, x, p. 79] includes *Cladosporium herbarum* var. *citricola* on orange, *Uromyces decoratus* on *Crotalaria juncea*, *Phytophthora* sp. on carnation, *Cercospora dioscoreae* on yam (*Dioscorea alata*), *Cytospora* sp. and *Oidium* sp. on mango, *Rosellinia arcuata* on apple, *Sclerotium rolfsii* on eggplant, *Phakopsora vitis* on vine, and *Gloeosporium papayae* on papaw. In the last-named disease, papaw fruits 8 to 10 days old shrivelled and fell after a wet period; no external mycelium was present, but the fruits were discoloured at the stem end. Isolations from diseased material invariably gave *G. papayae*, which grew vigorously on sterile unwounded papaw fruits, rotting them completely in fifteen days. Inoculation tests demonstrated that the fungus was able to attack immature and previously uninjured fruits on the tree, the original symptoms being reproduced and the organism recovered from the lesions.

Plantains were affected by a condition closely resembling that caused in the West Indies by *Bacillus musae* [*Bacterium solanacearum*: ibid., x, p. 472], and also by a rot (apparently bacterial) which affects the tip of the unrolled leaf and the youngest leaves and fruit spike still enclosed within the pseudo-stem.

A study has been undertaken of the virus diseases of Solanaceous crops. The commonest disease of tobacco was bacterial wilt (*Bacillus* [*Bact.*] *solanacearum*), but this was not known to affect large areas.

Notes are given on numerous other diseases investigated in Ceylon during the period under review.

SUNDARARAMAN (S.). **Administration Report of the Mycologist for the year 1930–1.**—20 pp., 1932.

Blast of rice [*R.A.M.*, x, p. 337] occurred with unprecedented severity at Coimbatore, Madras, during the period under review.

Periodical counts of the incidence of sugar-cane mosaic [ibid., x, p. 360] in the experimental plots confirmed the previous year's observation that under Coimbatore conditions secondary infection makes rapid progress between the second and fourth months of the growing period, followed by a sharp decline till after the seventh month, when infection ceases altogether.

The percentage of seedling blight (*Colletotrichum* sp.) infection on Uppam cotton at the Central Farm ranged from 30 to 82, with an average of 60·5.

The incidence of 'clump' of groundnuts [ibid., vii, p. 696] at the Agricultural Research Station, Palakuppam, ranged from 2·4 to 17 per cent.; the yield of diseased plants was about 30 per cent. of the normal.

Out of a total of 64,567 gingelly [*Sesamum indicum*] plants in a field on the Central Farm, 23,642 (36·6 per cent.) showed infection by wilt (*Macrophomina phaseoli*) [ibid., x, pp. 360, 437], the yield from the diseased plants being only about 43 per cent. of the normal. Soil infection experiments with the fungus gave positive

results on black gram [*Phaseolus mungo*], *S. indicum*, mustard, French bean [*P. vulgaris*], and sunflower, the two first-named being the most susceptible. The pycnidia of the fungus developed on sterilized portions of *P. mungo* and *S. indicum* stems inoculated with the strains isolated from these hosts respectively, and they were further detected on diseased Cambodia cotton stems, this being the first record of the development of the *Macrophomina* stage on the host in question.

Plantain wilt (*Fusarium cubense*) was observed chiefly on the Rastali variety but occasionally also on Poovan in the Trichinopoly district [cf. ibid., ix, p. 730].

Mosaic of *Dolichos lablab* was much in evidence. The leaves were severely mottled and affected plants shed their flowers more freely than healthy ones [cf. ibid., xi, p. 150].

Durrell (L. W.). **Report of the Botanist.**—*Forty-fourth Ann. Rept. Colorado Agric. Exper. Stat. for the fiscal year 1930–31*, pp. 25–31, 1931.

The most important disease of greenhouse plants in the Denver district of Colorado was found to be root rot of carnations, the causal organism of which (*Rhizoctonia*) is transmissible by cuttings from infected stocks, and is also liable to be spattered from the soil to the leaf sheaths in watering. Copper carbonate dust has proved superior to sulphur in the control of sweet pea mildew (*Erysiphe polygoni*) under glass. The Sidawitz chrysanthemum variety has shown susceptibility to blackleg (*Cylindrosporium*) [*chrysanthemi*]. Bacterial canker of tomato (*Aplanobacter michiganense*: see above, p. 210] and purple blotch of onions (*Macrosporium porri*) [*R.A.M.*, x, p. 499] were the chief diseases in the Arkansas Valley truck crops.

Sackett (W. G.). **Report of Bacteriologist.**—*Forty-fourth Ann. Rept. Colorado Agric. Exper. Stat. for the fiscal year 1930–31*, pp. 19–25, 1931.

The most promising lucerne varieties among those undergoing trials for reaction to winter injury and bacterial wilt [*Aplanobacter insidiosum*: *R.A.M.*, x, p. 602] are the Canadian Variegated, Cossack, and Grimm. Counts made in the spring of 1931 showed considerable mortality in the Common and Argentine varieties, the stands of which are in their critical third year, when the disease is liable to assume economic importance.

No benefit has been derived from the use of two- to three-year-old bean [*Phaseolus vulgaris*] seed as compared with one-year-old in respect of resistance to bacterial blight [*Bacterium phaseoli*: ibid., x, p. 439], which severely attacked all the bean crops throughout the State, including a number of selected Wisconsin varieties reputed to be resistant.

Melchers (L. E.). **A check list of plant diseases and fungi occurring in Egypt.**—*Trans. Kansas Acad. Sci.*, xxxiv, pp. 41–106, 1931.

Alphabetical lists are given of the fungi and their hosts observed by the writer during his survey of the plant diseases of Egypt

from 1927–29, with localities, dates, and names of collectors (where known). A short list is also given of diseases due to physiological or other agencies distinct from fungi and bacteria.

ABBOTT (E. V.). **Further notes on plant diseases in Peru.**—*Phytopath.*, xxi, 11, pp. 1061–1071, 1931.

Several plant diseases hitherto unreported in Peru have come to the writer's attention since the publication of his former paper [*R.A.M.*, ix, p. 63], while fresh information on the importance and distribution of others has been accumulated. The following are some of the more interesting records.

Sugar-cane mosaic [ibid., viii, p. 688] is very widespread in the Carabayllo Valley, many fields, especially the old ratoons, showing 90 to 100 per cent. infection. At present there is little indication of failure in the Otaheite and Bourbon varieties, even where they have been infected for eight or ten years. Mosaic has not been found outside the Rimac area, and a strict quarantine has been placed on the exportation of seed cane from this region to other parts of the country. The Otaheite variety is occasionally affected by mechanical twisted top [ibid., ix, p. 341] in a mild form.

Cotton wilt (*Fusarium vasinfectum*) is rapidly becoming so serious that several plantations in the Rimac and Carabayllo Valleys have been abandoned. The American Upland varieties, Rowden 40, Rowden 2119, Super Seven, Dixie Triumph, and Express, which have shown resistance to wilt in the United States, all proved to be more susceptible at Lima than the native Tanguis. In the coastal valleys cotton is liable to attack by *Erysiphe malachrae*, sometimes causing partial defoliation but occurring too late in the season to do much damage. *Alternaria* leaf spot killed five acres of cotton seedlings near Lima in 1929.

Stripe rust of wheat (*Puccinia glumarum*) is not uncommon in the sierra. No evidence has been obtained that the species of *Berberis* native to Peru play any part in the perpetuation of stem rust (*P. graminis*), nor was infection found on any of the wild grasses in the valleys near Lima. Rust epidemics near the sea are believed to be initiated by wind-blown spores from the sierra.

Helminthosporium sativum causes heavy damage to Khapli emmer wheat, the only durum variety that can be cultivated on the coast on account of its resistance to stem rust, and also attacks barley. *H. oryzae* has been identified as the cause of 'black point' of rice in several coastal valleys [ibid., x, p. 55].

Phyllachora maydis [ibid., vii, p. 538] is responsible for the premature shrivelling of maize leaves on the coast, while the same host is occasionally infected by *Phoma zeicola* [ibid., vii, p. 711].

Late blight of potatoes (*Phytophthora infestans*) is less prevalent in Peru than was formerly supposed, and does not affect either wild or cultivated species of *Solanum* at elevations above 8,000 to 9,000 ft. The absence of the disease from these regions and its occurrence only where foreign seed-stock has been introduced lend support to Reddick's theory [ibid., vii, p. 739] that the fungus is not indigenous to South America.

Powdery scab of potatoes (*Spongospora subterranea*) is extremely widespread, usually affecting at least 10 and often 50 per cent. of the crop or more; the fungus is, in all probability, endemic in Peru.

The presence of potato wart (*Synchytrium endobioticum*) appears to be restricted to one farm known as Cachi-Cachi, where it was found in 1928 and 1929, but not in 1930. Other diseases of potatoes in Peru include the rusts, *Aecidium cantensis* and *Puccinia pitteriana* [ibid., x, p. 491]; powdery mildew (*Oidium* sp.); stem rot and black scab (*Corticium vagum*) [*C. solani*], which causes severe damage to the choice yellow-fleshed varieties and also attacks a number of other economic plants; tuber rots (*F. martii* [var.] *minus* and *F. solani*); and mosaic.

Diplodia rot of oranges (*D. natalensis*) and a *Fusarium* wilt of papaws are amongst the fruit diseases mentioned.

Tomatoes often suffer severely from mosaic, which in 1929 caused losses amounting to between 50 and 75 per cent. of the crop. Pepper [*Capsicum annuum*] mosaic [ibid., x, p. 809] is also common and often important.

ACOSTA (D. R. y). **Investigaciones fitopatológicas.** [Phytopathological investigations.]—*Min. Indus. Direc. Agron. Publ. Mens.*, iv, 1–2, pp. 1–18, 21 figs., 1931.

A list is given of the diseases of the principal crops and other economic and ornamental plants observed in Uruguay month by month during the period from May, 1929, to December, 1930. Notes are also given on a number of these diseases, of which the following may be mentioned: *Clasterosporium carpophilum* on plums, damsons, and peaches, the last-named host being attacked with particular severity; *Colletotrichum gloeosporioides* on lemon and orange; *Gloeosporium hesperidearum* [*R.A.M.*, x, p. 24] on tangerine and orange, the latter being also infected by *Alternaria citri* and *Phytophthora parasitica* [loc. cit.]; *G. olivarum* on olive [ibid., x, p. 608]; *Coniothyrium diplodiella* on vine [ibid., xi, p. 21]; and yellow rust of wheat (*Puccinia glumarum*), observed for the first time in Uruguay in November, 1929, and again in October, 1930 [ibid., x, 509].

QUIRK (AGNES J.). **Pure smooth and rough colony types at will.**—*Science*, N.S., lxxiv, 1923, p. 461, 1931.

By means of a special technique involving needle transfer to nutrient broth tubes at P_H 6 and P_H 7, respectively, dilution by a second needle transfer to similar tubes, incubation for 18 to 24 hours at room temperature, and again a double dilution transfer to new tubes, it was found possible to produce at will by pouring from the last tubes plates of beef infusion agar at the two P_H values, either smooth (virulent) or rough (non-virulent) colonies of *Bacterium tumefaciens* (hop strain) and *Bacillus phytophthorus* [cf. *R.A.M.*, vi, p. 458]. The smooth colony type was produced only at P_H 7 and the rough one at P_H 6.

THOMAS (J. A.). **Sur les réactions de la tunique d'Ascidia mentula Müll., à l'inoculation de Bacterium tumefaciens.** [On the reactions of the tunic of *Ascidia mentula* Müll. to inoculation with *Bacterium tumefaciens*.]—*Comptes rendus Soc. de Biol.*, cviii, 33, pp. 694-696, 1931.

A virulent strain of *Bacterium tumefaciens*, a thick emulsion of which was inoculated into the tunic of six individuals of *Ascidia mentula*, provoked intense histological reactions, consisting in proliferation and the development of giant cells with a diameter of 25 μ compared with 2 to 3 μ for normal ones.

THOMAS (J. A.). **Sur l'infection du Géphyrien Sipunculus nudus par le Bacterium tumefaciens.** [On the infection of the Gephyrean *Sipunculus nudus* by *Bacterium tumefaciens*.]—*Comptes rendus Soc. de Biol.*, cviii, 34, pp. 772-774, 1931.

A number of individuals of *Sipunculus nudus*, inoculated in the general cavity with 0·5 c.c. of an emulsion of a virulent strain of *Bacterium tumefaciens*, previously used in experiments on *Ascidia mentula* [see preceding abstract], died in six days. The organism acquired such a degree of virulence by passage through the worms that, after the third passage, it proved fatal in 15 hours. The process of infection is characterized by marked caryotropism on the part of the parasite, which is transformed, in the nucleus and cytoplasm, into grains near the limit of visibility. On the other hand, vigorous reproduction in the form of rod-shaped elements takes place in the protoplasm as a result of the acquisition of septicaemic properties by the organism.

DIPPENAAR (B. J.). **'N bakteriese siekte wat 'n verdorring van die kaffies van Koringare veroorsak.** [A bacterial disease causing desiccation of the glumes of Wheat ears.]—*S. African Journ. of Sci.*, xxviii, pp. 280-283, 1 fig., 1931.

A brief description is given of the symptoms of basal glume rot of wheat (*Bacterium atrofaciens*) [*R.A.M.*, viii, p. 395] which was observed for the first time in South Africa on the Kleintrou variety in 1930.

GOULDEN (C. H.) & NEATBY (K. W.). **Breeding rust-resistant varieties of spring Wheat.**—*Journ. Amer. Soc. Agron.*, xxiii, 11, pp. 859-870, 1 graph, 1931.

Continuing their investigations on the development of spring wheat varieties resistant to rust (*Puccinia graminis*) at Winnipeg, Canada [*R.A.M.*, x, p. 170], the writers conducted tests [the results of which are fully tabulated and discussed] on groups of strains possessing a high degree of mature plant resistance from three crosses, viz., H-44-24 × Marquis, H-44-24 × Reward, and Pentad × Marquis. It was found that in 1930, when there was a severe rust epidemic, the yields of the resistant strains considerably exceeded those of the best standard varieties, Marquis, Garnet, and Reward. The differences in rust reaction within the standard varieties were further shown to be considerably greater than those within the resistant groups. In a study of the seedling reactions to forms 48, 14, 52, and 36 of *P. graminis* of 12 F_5 lines of

Pentad × Marquis, the reactions obtained were practically identical with those of Marquis, thus establishing the independence in inheritance of seedling resistance and the mature plant resistance typical of Pentad.

Peuser (H.). **Untersuchungen über das Vorkommen biologischer Rassen von Fusarium nivale Ces.** [Investigations on the occurrence of biologic strains of *Fusarium nivale* Ces.]—*Phytopath. Zeitschr.*, iv, 1, pp. 113–128, 3 figs., 1931.

After a preliminary note on the pathogenicity of *Calonectria graminicola* (*Fusarium nivale*) to cereals in Germany, in which Baltzer's views on the saprophytic nature of this fungus [*R.A.M.*, x, p. 94] are disputed, the writer describes his investigations on the occurrence of biologic forms among 50 isolations from various parts of the country.

Considerable difficulty was experienced in obtaining conidia in sufficient numbers for inoculation, most of the nutrient media used seeming rather to encourage mycelial or perithecial formation. Appel's oatmeal agar [cf. ibid., iv, p. 161] proved most useful. The conidia were produced almost exclusively in cultures or parts of cultures exposed to daylight, and a test was therefore made to determine the effect on sporulation of (*a*) monochromatic yellow, (*b*) panchromatic, and (*c*) monochromatic blue rays. The panchromatic and blue rays were found to induce conidial formation to nearly the same extent as daylight, while the yellow ones were almost entirely inhibitory in this respect.

Of the various modes of inoculation tested, infection through the soil gave the most reliable results. The pure line wheat seed-grains (pure lines of rye were not available) were placed 3 cm. below the surface in flower pots containing sifted sand, and covered with a layer of mixed sand and oatmeal, above which a conidial suspension of *F. nivale* in semi-liquid biomalt agar was distributed (20 c.c. per pot). Four to five days after the commencement of the test a delicate, cobweb-like mycelium developed on the surface of the pots; in eight days the seedlings emerged, and after ten to twelve days the first symptom of infection—a brown discoloration of the cotyledonary sheath just above soil level—became apparent. All the twelve standard wheat varieties (including the well-known Strube's Dickkopf, Pflug's Baltikum, Criewener 104, and Krafft's Siegerländer) tested for their reaction to 37 isolations of *F. nivale* proved highly susceptible, and no indication of biologic specialization in the fungus was observed. In a further test with seven primitive forms, it was found that *Triticum monococcum* was the most susceptible, followed by *T. polonicum* and *T. durum*, while *T. spelta* proved resistant.

Peturson (B.). **Epidemiology of cereal rusts.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 44–46, 1931.

Stationary slide exposures made in the summer of 1930 showed that no definite spore showers of *Puccinia graminis* occurred in

western Canada during June, but that a light sprinkling of spores was gradually coming in from the south. Far fewer spores were caught on the slides exposed in Manitoba during June than during the same month in 1927 and 1929 [cf. *R.A.M.*, ix, p. 439]. The first spores were caught at Saskatoon and Indian Head on 1st July and at Edmonton on 29th July. The first definite spore shower, which extended over the whole of Manitoba and eastern Saskatchewan, occurred on 14th July; on 23rd July the spore counts at all the stations east of Saskatoon increased from merely several to several hundred spores per square inch of slide, and by the 26th of the month counts of several thousand spores per square inch were quite common. Subsequently, the numbers deposited were much greater than during the corresponding period in any previous year and mostly were undoubtedly of local origin.

Relatively few spores were caught on slides exposed during aeroplane flights over Lac du Bonnet, Manitoba, during June and the first two weeks of July. A considerable increase in spore count occurred on 14th July, followed by a still greater increase on 23rd July.

Stem rust of cereals was first observed in Manitoba on 26th June, in Saskatchewan on 11th July, and in Alberta on 10th August; by 20th July it had become quite prevalent in Manitoba and eastern Saskatchewan and a severe epidemic appeared to be likely, but from then on further rust development was checked by the dry weather. Leaf rust of wheat (*P. triticina*) covered about the same area as stem rust, but was not quite so severe. Evidence was obtained of the overwintering of *P. triticina* in Alberta.

Stem rust caused no damage in Alberta or in the western half of Saskatchewan. The rust losses in 1930, although considerable in eastern Saskatchewan and Manitoba, were much lighter for the whole of western Canada than in 1927 [ibid., viii, p. 360].

NEWTON (MARGARET), JOHNSON (T.), & BROWN (A. M.). **The constancy of physiologic forms.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 48–51, 1931.

In genetic studies (conducted at Winnipeg) of physiologic forms of *Puccinia graminis* var. *tritici* [*R.A.M.*, x, pp. 16, 169, 365] a cross made between forms 9 and 36 produced F_1 hybrids identified as form 17. This hybrid form was selfed and 126 F_2 cultures were studied for pathogenicity on the 12 wheat differential varieties. The F_2 cultures were identified as one or another of forms 1, 11, 15, 17, 36, 57, and 85.

The cross, form 9 × form 15, produced F_1 hybrids identified as form 9. This hybrid form 9 on selfing produced F_2 hybrids identified as one or another of forms 9, 85, 57, and 15.

In several of the crosses there was evidence of the presence of a type of inheritance inexplicable on a Mendelian basis. For example, in a cross between forms 14 and 36 the hybrids arising from the form 14 side were identical with form 14, while those from the opposite side were different in pathogenicity and were identified as form 88, a new physiologic form.

NEWTON (MARGARET), JOHNSON (T.), & BROWN (A. M.). **The seasonal distribution of physiologic forms of Puccinia graminis var. tritici in Canada.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 46–47, 1931.

In this report of the distribution of physiologic forms of *Puccinia graminis* var. *tritici* [cf. *R.A.M.*, viii, p. 707] in Canada in 1929 the forms arising from barberries are excluded in view of the hybridization on that host and the results confined to those from cereals and grasses. Previous lists are revised on this basis.

Although 39 physiologic forms of *P. graminis* var. *tritici* were isolated in Canada between 1919 and 1929, different physiologic forms predominate in different years. From 1919 to 1921 form 17 predominated and form 21 was rare; from 1922 to 1929 form 21, on the other hand, was one of the commonest, while form 17 was very scarce. In 1925 form 36 suddenly became predominant and in 1929 it formed 22 per cent. of all collections.

JOHNSON (T.). **The germination of Wheat stem rust teliospores.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 51–52, 1931.

This paper describes work undertaken to germinate greenhouse-formed teleutospores of certain physiologic forms of wheat stem rust [*Puccinia graminis* var. *tritici*] as soon as possible after their formation, in order that they could be used in hybridization studies [*R.A.M.*, xi, p. 164]. Teleutospores of each physiologic form were produced at 55° to 60° F. and at 70° to 75°. Soon after their formation, they were frozen in water for two to seven days at a temperature of about −5° C. They were then thawed and placed under a spray of tap water at 5° to 10° C. for seven days, after which they were tested for germination, invariably with a negative result. They were then dried in the laboratory for two days, soaked over-night in water, and again tested for germination. They commonly began to germinate after the first drying, and alternate wetting and drying was continued as required. The shortest period between the completion of teleutospore formation and the germination of the spores was twenty days; spores frequently germinated between thirty and forty days after formation. Teleutospores formed at the lower temperature tested germinated more abundantly, and more consistently, than those formed at the higher temperature.

VERWOERD (L.). **Die fisiologiese vorms van Puccinia graminis Pers. wat in Suid-Afrika voorkom.** [The physiologic forms of *Puccinia graminis* Pers. occurring in South Africa.]—*S. African Journ. of Sci.*, xxviii, pp. 274–279, 1931.

Stem rust of cereals (*Puccinia graminis*) is stated to have been first observed in South Africa in 1708, when it appeared on rye. Serious epidemics in wheat occurred in the Cape Province between 1896 and 1902, and the crop has only been saved from ruin by the introduction of the Rieti variety.

Eight forms of *P. graminis tritici* are found in South Africa [*R.A.M.*, xi, p. 164], viz., 13, 21, 29, 34, 38, 98, 99, and 100, the

three last being new; *P. graminis avenae* is represented by two forms (2 and 3), *P. graminis secalis* by two (unidentified), and *P. graminis phlei-pratensis*, *P. graminis agrostidis*, and *P. graminis poae* by one each. Form 34 of *P. graminis tritici* is extremely virulent and attacks not only wheat (Acme and Unie 52) but *Hordeum murinum* and *Dactylis glomerata* (the latter also being infected by form 99). *Bromus maximus* is liable to infection by form 100 and Kaalgars barley by 98. Burbank wheat is attacked by form 21 and Kubanka by 29 and 38; Arnautka is susceptible to 98 and 21 as well as to 34. A table is given showing the reactions of these and other varieties to the eight forms.

Form 3 of *P. graminis avenae* was found on Fulghum and Algerian oats, *Avena fatua*, and *D. glomerata*, while 2 occurs on *H. murinum*, Fulghum and Sunrise oats, *A. fatua*, *D. glomerata*, and *H. murinum*. The White Tartar variety of oats was found to be very susceptible to form 3 and Joanette to form 2, while Richland is fairly resistant to both.

GASSNER (G.) & STRAIB (W.). **Zur Frage der Konstanz des Infektionstypus von Puccinia triticina Erikss.** [On the question of constancy in the infection type of *Puccinia triticina* Erikss.]—*Phytopath. Zeitschr.*, iv, 1, pp. 57–64, 1 col. pl., 1931.

Contrary to the generally accepted belief that the type of infection produced on a certain cereal by a given rust is constant and predominantly independent of external factors, the writers' investigations at Brunswick with form XIV of *Puccinia triticina* [*R.A.M.*, ix, p. 768; xi, p. 33] showed that some of the reputedly highly resistant standard wheat varieties become very susceptible at low temperatures (8° to 12°, minimum 6° C.) [cf. ibid., ix, p. 99; x, p. 714; xi, p. 167]. Among these were Malakoff, Norka, Democrat, Mediterranean, v. Rümker's Sommerdickkopf, Roter Tiroler Spelz, and Kanred. On the other hand, the Webster, an unnamed (C.I. 3747), and Halland varieties maintained their resistance at the lower temperatures.

ALLEN (RUTH F.). **Heterothallism in Puccinia triticina.**—*Science*, N.S., lxxiv, 1923, pp. 462–463, 1931.

Continuing her studies on sex in the rusts [*R.A.M.*, x, pp. 168, 235], the writer found that *Puccinia triticina* is heterothallic, and reports the discovery of receptive hyphae similar to the trichogynes described by Andrus in other rusts [ibid., x, p. 810]. A monosporidial infection may bear both spermogonia and receptive hyphae, but unless spermatia are brought to it from a different infection the aecidia remain haploid and gradually degenerate.

A comparative investigation of a number of young infections shows that some have many spermogonia and few receptive hyphae and vice versa, while a few have no spermogonia and an abundance of receptive hyphae. The intermediates in this series were found to be more numerous than the extremes. In one sterile infection 42 days old there were 103 spermogonia and only 23 small sterile aecidia. Another large sterile infection from the same lot con-

tained over 200 sterile aecidia and no spermogonia. The infections of *P. triticina* can be arranged in a series with an almost exclusively spermogonial type at one end and a completely aecidial type at the other.

Before fertilization the receptive hyphae, like the haploid mycelium in which they originate, consist of uninucleate cells. On fertilization the receptive hyphae at the stomata are found crowded with nuclei, of which 2 to 6 are common, while as many as 11 have been seen in a single cell. The aecidium is permeated by growth from these cells. The young fertile aecidium makes vigorous growth; it is composed of a matrix of haploid cells interspersed throughout with cells containing two or more nuclei. The aecidium undergoes differentiation into a lower half of large, vacuolated cells, which afterwards die, and an upper half of smaller, denser cells, many of them multinucleate. The number of nuclei is variable, amounting in extreme cases to 15 or 20 per cell and decreasing with further growth and cell division. The young basal cells of the sporogenous layer formed by cells growing down from the upper mass contain 2 to 8 nuclei. The extra nuclei are used to form the first spores, and by the time the spore chains are well started the basal cells are regularly binucleate. Occasionally aecidia open on the upper surface, but either fertilization of the upper receptive hyphae (which are found emerging between the epidermal cells) is rare, or else those that are fertilized grow to the lower surface before further development, a process not yet observed.

HASKELL (R. J.), LEUKEL (R. W.), & BOERNER (E. G.). **Stinking smut (bunt) in Wheat and how to prevent it.**—*U.S. Dept. of Agric. Circ.* 182, 20 pp., 9 figs., 1931.

After stating that bunt of wheat [*Tilletia caries* and *T. foetens*] causes an annual loss in the United States of some 18,000,000 bushels and that 11·5 per cent. of the 1929 crop was bunted, the authors stress the importance of thoroughly cleaning the seed and then treating it with copper carbonate (2 oz. of 50 per cent. grade or 3 oz. of 18 to 20 per cent. grade per bushel), using a commercial or home-made dusting machine, or with formaldehyde (1 pint in 40 galls.), using a machine which brings the bunt balls to the surface of the liquid, where they can be skimmed off. A field survey of spring wheat in 1930 [*R.A.M.*, x, p. 228] revealed that many farmers were not using proper methods of seed treatment.

GORDON (W. L.). **Physiologic specialization in Puccinia graminis var. avenae.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 58–59, 1931.

In addition to the seven distinct physiologic forms of *Puccinia graminis* var. *avenae* isolated from collections made in various parts of Canada in 1929 [*R.A.M.*, x, p. 176], all of which were previously known to occur in the Dominion, physiologic form 8, hitherto reported only in Australia [cf. ibid., ix, p. 703], was twice isolated, once from a collection of uredosori on Monarch Strain oats at Nappan, Nova Scotia, and once from aecidia on a barberry [*Berberis* sp.] artificially inoculated in a greenhouse at Winnipeg.

Less virulent than form 6, form 8 is more virulent than the commonly found forms 1, 2, and 5. All the known physiologic forms of *P. graminis* var. *avenae* have now been isolated from Canadian collections.

PETURSON (B.). **Physiologic specialization in Puccinia coronata var. avenae.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 57, 1931.

Seven distinct physiologic forms were isolated from one hundred and three collections of *Puccinia coronata* var. *avenae* [*P. lolii*: *R.A.M.*, x, p. 177] obtained from various parts of Canada in the summer of 1929. Forms 1, 4, 11, and 12 occurred fairly commonly. Of all the forms identified form 1 was the most virulent and the commonest, comprising 27·1 per cent. of the 1928 collections and 36 per cent. of those identified in 1929. It was collected from Saskatchewan to Prince Edward Island.

REED (G. M.). **Inheritance of smut resistance in hybrids of Early Gothland and Monarch Oats.**—*Amer. Journ. of Botany*, xviii, 9, pp. 803–815, 1931.

The essential features of the writer's researches on the inheritance in oat hybrids of the Early Gothland and Monarch varieties of resistance to the loose and covered smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) have already been noticed from another source [*R.A.M.*, x, p. 515].

BLATTNÝ (C.). **Mazlavá snět' žitná.** [Bunt of Rye.]—*Ochrana Rostlin*, xi, 3–4, p. 139, 1931.

The author states that rye bunt (*Tilletia secalis*) [*R.A.M.*, x, p. 372], which usually is of rare occurrence in Czecho-Slovakia, was very prevalent in 1931 on the rye variety Elite imported from Germany.

SANFORD (G. B.). **A new disease of Corn in Alberta.**—*Rept. Dominion Botanist for the year 1929, Div. of Botany, Canada Dept. of Agric.*, pp. 88–89, 1 fig., 1931.

An apparently new disease was first observed on maize in Alberta in 1927, when a number of fully grown Golden Bantam plants in the ear stage were severely blighted, several being killed; the disease reappeared in the same locality the following year.

All the parts of the plant above the ground were affected, and severe necrotic lesions sometimes extended into the cob from the surface. Apparently, the leaves were the part most severely attacked. The first indication of the disease on the green leaf is an exudate which dries, leaving a small, raised, light-coloured spot up to 1 mm. in diameter. The exudate quickly becomes surrounded by a water soaked area. There appears to be a slight tendency for the lesions to be limited by the leaf veins. Later, each spot is usually bounded by a brownish, rusty margin. The lesions, which are most numerous and pronounced on the upper surface of the leaf, may coalesce into long or irregular water soaked or rusty areas.

The disease is apparently of bacterial origin, but the cause has not yet been established.

Blattný (C.). **Fusariosa na Kukuřici (Zea mays), málo známá choroba mladých rostlin.** [Fusariosis of Maize (*Zea mays*), a little known disease of young seedlings.]—*Ochrana Rostlin*, xi, 3–4, pp. 129–132, 3 figs., 1931.

This is a brief account of a seedling blight, caused by a species of *Fusarium*, which was observed in Czecho-Slovakia in a number of maize plants of the White Tyrolese variety of Austrian origin grown in pots for experimental purposes. The fungus killed 4 per cent. of the seed before germination and 6 per cent. of the seedlings after emergence from the soil. On the stems of the latter it formed a dense, sclerotium-like mycelial overgrowth, from which the hyphae spread in a dense, white, fluffy mass over the surrounding soil. On soil extract agar the organism produced an abundance of white, fluffy aerial mycelium, without discoloration of the substratum, but beet agar was occasionally superficially discoloured pink. Pionnotes with conidia developed 36 days after inoculation of the cultures; these bodies are small, reddish-orange, and surrounded by the mycelium. Sclerotium-like formations, similar to those observed on the host plant, were also produced in pure cultures. The conidia are rather curved, with obtuse ends, one- or two-septate, and average 18·7 by 3·3 μ in diameter (extremes 13·2 to 26·4 by 1·65 to 4·4 μ); they were not observed on the host plant. The fungus, in its morphological and cultural characters, stands closest to *F. aurantiacum* [*R.A.M.*, viii, p. 772], with which it may eventually prove to be identical.

Examination of maize seed from the same lot showed that out of 300 grains 21 were infected with the species of *Fusarium* internally, indicating that infection occurred in the ears. This leads the author to recommend seed disinfection of maize imported from Austria, since once introduced the disease may prove very injurious in Czecho-Slovakia.

Dufrénoy (J.) & Frémont (Mlle T.). **Influence de la température sur les réactions du Maïs à l'infection fusarienne.** [The influence of temperature on the reactions of Maize to fusarial infection.]—*Phytopath. Zeitschr.*, iv, 1, pp. 37–41, 5 figs., 1931.

From maize plants suffering from foot rot in the south-west of France the writers isolated a species of *Fusarium* which was identified by Wollenweber as *F. graminearum*, and a study was made of the cytological reactions induced in maize seedlings by inoculation with this parasite at low (7° C.) and high (20°) temperatures, the former accelerating and the latter retarding the course of the disease [*R.A.M.*, v, p. 247]. Subsequently the perithecial stage of the fungus (*Gibberella saubinetii*) developed on lupin stem cultures.

At the low temperature the plants develop very slowly, and the fungus forms only a scanty aerial mycelium, but rapidly sends out bundles of hyphae between the foliar sheaths and then between the cells, which remain alive for some time. The cytoplasm of the affected cells becomes spongy, forming a network of trabeculae that divide the vacuolar apparatus into a large number of small vacuoles. This phenomenon is particularly conspicuous near the nucleus,

where the hyperchromatic zone believed to be due to proteolysis resembles the 'cell inclusions' of mosaic plants. Neither these nor the adjacent cells form phenolic compounds in their vacuoles. Finally, the hyphae penetrate the interior of the cells, where they induce the formation of callosities staining with the Millon-Denigés reagent. The seedling perishes from general decay and the *Fusarium* develops luxuriantly as a saprophyte.

At 20° a very different picture is presented by the seedlings, the rapid growth of which keeps pace with that of the fungus. A profuse aerial mycelium is formed, but the hyphae are apparently unable to penetrate the living cells, which react to attempted infection by fragmentation of the vacuolar system and production in the vacuoles of phenolic compounds, accompanied in certain tissues by the development of lignified protuberances as described by Dickson.

The essential feature of the cytological reaction of maize seedlings resistant to *G. saubinetii* is considered to be the formation of phenolic (tannin) compounds, which has further been observed in various other cases [cf. ibid., vii, p. 458; ix, pp. 50, 96].

[Wallace (G. B.).] **The smuts of Sorghum and their control.**—*Tanganyika Dept. of Agric. Mycol. Leaflet* 11, 6 pp., 1931.

The following smuts of sorghum are reported to occur in Tanganyika: grain or covered kernel smut (*Sphacelotheca sorghi*), loose smut (*S. cruenta*), head smut (*Sorosporium reilianum*), and long smut (*Tolyposporium ehrenbergii*) [*R.A.M.*, ix, p. 745]. Of these, *Sphacelotheca sorghi* is by far the most common, having been found affecting 60 per cent. of 25 Bonganilho heads examined on 1st July 1931 (20 to 90 per cent. infection in individual heads). *S. cruenta* occurs to a slight extent, attacking practically all the grains in a head, while *Sorosporium reilianum* is usually negligible and *T. ehrenbergii* has not been seen recently. The following percentages of *Sphacelotheca sorghi* were observed at Morogoro Experiment Station on 8th July 1930: Kihemba-hemba variety 52, Karachi 28, Ngwana Kimba 10, Bonganilho 5, Kilinyali 1, and Sukesha 1. At the end of June 1930, when only Bonganilho and Sukesha were grown on the station, no loose or head smuts were observed, but the former showed 4·5 per cent. infection by *S. sorghi* and the latter 1 per cent. At Singida Bonganilho was reported to show 20 per cent. of grain smut in May 1931, and Kilinyali 2 per cent. *S. sorghi* appears to be particularly destructive to Bonganilho in the Singida district.

The grain and loose smuts of sorghum may be controlled by seed disinfection with 2 per cent. copper sulphate (sprinkling or 10 to 15 minutes' immersion) or 0·5 per cent. formalin (two hours). The cost of the former treatment is about 5 cents and of the latter 12 cents for 15 lb. of seed or sufficient to sow one acre. The natives of Tanganyika and Nyasaland keep the head smut in check by eating the young diseased heads.

Control of Citrus gummosis.—*Bombay Dept. of Agric. Leaflet 7 of 1931*, 2 pp., 1931.

Popular notes are given on the symptoms and control of citrus

gummosis [*Phytophthora* sp.], which is stated to be the cause of heavy losses in the Bombay Presidency, where experiments have been conducted from 1927 to 1931 to determine a suitable mode of treatment. It was found that the hyphae of the fungus cannot penetrate the resistant Jamburi stock, on which Mosambi [orange] trees should therefore be budded. Instead of piling up the soil round the trunks of the trees, especially those budded low or planted deep, a small encircling mound should be made in order to prevent both soil and irrigation water from coming into direct contact with the trunk. The excessive flooding of gardens should be avoided. Unless infection has spread round two-thirds of the trunk it may be arrested by the excision of the diseased brown bark, the application of creosote oil (25 to 30 per cent.) to the exposed wood, and painting over with coal-tar after the surface of the wound is dry.

Mold infection of fruit.—*Science*, N.S., lxxiv, 1924 (*Supplement*), pp. 12–13, 1931.

Working at the Catholic University of America, Washington, D.C., H. T. O'Neill and A. J. Harriman found that blue mould [*Penicillium italicum*] enters oranges exclusively through breaks in the skin made by clipper cuts, the workers' finger nails, box splinters, projecting nails, and the like [*R.A.M.*, xi, p. 104]. Not one out of 400 sound, whole-skinned oranges kept in a damp, dark cellar for three months was lost through mouldiness, although mouldy fruit was kept among them to ensure sources of infection. In order to facilitate the detection of the microscopic scratches which are overlooked in grading, it is necessary to apply a metallic salt capable of reacting with the tannin in the subepidermal tissues and forming a dark, conspicuous streak. Ferric chloride has been found particularly suitable for this purpose, immediately making minute abrasions visible as dark lines while leaving sound fruit unmarked. The salt is removed by washing the fruit in clear water. This process obviates the use of borax which acts as a preventive of infection [ibid., x, p. 728], but is open to various objections on hygienic grounds.

STAHEL (G.). **Zur Kenntnis der Siebröhrenkrankheit (Phloemnekrose) des Kaffeebaumes in Surinam. I. Mikroskopische Untersuchungen und Infektionsversuche.** [Contribution to the knowledge of the sieve-tube disease (phloem necrosis) of the Coffee tree in Surinam. I. Microscopic investigations and inoculation experiments.]—*Phytopath. Zeitschr.*, iv, 1, pp. 65–82, 8 figs., 1931.

Phloem necrosis is stated to be by far the most serious disease of Liberian coffee in Surinam [*R.A.M.*, x, p. 377], where it has been known to occur for upwards of thirty years, while the statement of P. Fermin in 1770 as to the desiccation and dying-off of entire fields of Arabian coffee is thought probably to refer to the same disturbance. The disease is found in all parts of the colony, even in isolated plantations. In British Guiana the so-called 'wilt' disease is responsible for the sudden withering and death of single bushes or groups in the midst of otherwise healthy fields [ibid., ix,

p. 288]. Excepting these two countries phloem necrosis appears to be unknown in coffee-growing areas.

After reviewing the scanty previous literature on the disease, the author describes the anatomical features of the disease [loc. cit.], which reappeared with extraordinary severity in 1930. It was equally prevalent on permeable sand and heavy clay. The average annual loss from phloem necrosis is estimated at 1 to 3 per cent. of the bushes, but in some plantations the loss may reach 10 or even 25 per cent. in years of severe infection.

The examination of root and stem sections, fixed and stained with equal parts of 6 per cent. potassium bichromate, 1 per cent. chromic acid, and 2 per cent. osmic acid, disclosed the regular presence in the necrotic sieve-tubes of small, spherical bodies of irregular contour, staining brown with osmic acid, which were absent from healthy material. In the sieve-tubes showing multiple division large numbers of black, fusiform bodies with apical flagella were detected; with the aid of Giemsa's stain these were found to contain nuclei. It was evident from these features that the organism in the necrotic sieve-tubes was a species of *Phytomonas* [*Leptomonas* of Lafont and França: ibid., i, p. 309] closely resembling *P.* [*L.*] *davidi*, which is prevalent in the latex of various Euphorbiaceae, chiefly in the tropics and subtropics [ibid., iv, p. 701; v, pp. 183, 760]. However, the coffee flagellate measures only 6 to 10 μ in length and 0·4 to 0·6 μ in breadth (occasionally 3 to 4 or 16 μ long and 0·2 to 1·2 μ broad) compared with 18 by 1·6 μ for *L. davidi*. Here and there subspherical forms occur which shed their flagella and thus constitute a transition to *Leishmania*; these are probably the forerunners of the above-mentioned degeneration forms in the dead sieve-tubes. The blepharoplast of the coffee flagellate is rod-shaped in contrast to that of *L. davidi*, which is globular. The flagellate was present in large numbers on 22nd April, 1931, i.e., about a month before the appearance of definite necrotic symptoms, in all the sieve-tubes of the soft bast in the diseased roots of a bush artificially inoculated by grafting on 30th December, 1930.

Attempts to culture the coffee flagellate on blood agar gave negative results. Fixation was best effected by Duboscq's method (picric acid-formalin-acetic acid-alcohol), and staining with Heidenhain's haematoxylin and Giemsa's solution. The organism is named *P. leptovasorum* n. sp.

The first inoculation experiments in the recent studies, like those of 1920, were based on the assumption that a filterable virus was responsible for phloem necrosis, and were carried out chiefly by grafting diseased shoots on healthy trees. All these tests gave negative results. On 30th August and 6th September 1930, three to four diseased roots, 30 to 40 cm. long, were grafted on each of 24 bushes; early in December nine more bushes, and on 30th December one more, were similarly treated. In the middle of February, 1931, 9 of the first lot of 24 bushes suddenly became diseased, 5 of the 9 treated early in December followed in the first week of May, while the bush treated on 30th December showed necrotic symptoms at the end of May. These results are considered to demonstrate the infectious character of the phloem

necrosis of coffee. *P. leptovasorum* was found in the sieve-tubes of all the experimentally infected bushes, its pathogenicity towards which can scarcely be doubted, though conclusive proof must await the successful isolation of the organism in pure culture.

Until the mode of transmission and alternate hosts of the agent of phloem necrosis are known, no rational scheme of control can be devised. Planters have been advised to eradicate diseased bushes as soon as the first external symptoms appear. The observation that bushes in plantations liable to flooding are scarcely affected by phloem necrosis suggests that the repeated inundation of severely infested fields might be beneficial.

KIRKPATRICK (T. W.). **Further studies on leaf-curl of Cotton in the Sudan.**—*Bull. Entomol. Res.*, xxii, 3, pp. 323–363, 2 pl., 1 diag., 1931.

After briefly stating the reasons that lead him to adopt the name 'leaf curl' for the virus disease of cotton in the Sudan, a preliminary report on which has already been noticed [*R.A.M.*, x, p. 187], and the symptoms of which may be, according to the varieties affected, a definite curling of the leaf margins, either upwards or downwards, a peculiar crinkled appearance produced by net-vein enations (the most characteristic feature on Sakel cotton), or mosaic in the form of chlorotic spots, the author gives a very full account of continued experiments, under controlled conditions, on the transmissibility of the disease. The results showed that the whitefly *Bemisia gossypiperda* (which transmitted the disease to healthy Sakel cotton plants in 157 out of 168 tests) is a very efficient, and in all probability the only vector of the disease, since attempts to transmit it by means of *Aphis gossypii* and of the jassid *Empoasca fascialis* gave negative results in every case. The whitefly can pick up the virus from those parts of an infected plant that show no symptoms of the disease, but it is still doubtful whether it can do so on inoculated plants before the symptoms have developed on the latter. Adults that develop from larvae grown on diseased cotton plants are infective without having to feed in the instar stage on infected plants. Once infected, the whitefly remains capable of transmitting the disease during at least 7 days, and probably throughout its life. The virus is picked up by the adult insect in just over 3 hours (possibly even less), but full infectivity is apparently attained only after a minimum stay on the source of infection of four and a half hours. The disease is transmitted to healthy plants in 30 minutes, and the whole process of infection of the insect and of the healthy plant has been accomplished in 6 hours 50 minutes. The virus is not transmitted through the egg of the whitefly.

There was a large amount of negative evidence that the disease is not transmissible through the seed of Sakel cotton or through the soil. The incubation period of the virus in the cotton plant varied from 8 to 34 days, but the great majority of the recorded periods were between 11 and 19 days. There was some indication that shading the inoculated plants, especially in conjunction with a low soil temperature, may retard the incubation period or the rapid development of the symptoms; the age of the plant did not

appear, however, to have any bearing on the duration of incubation. Little is known with certainty concerning the factors that influence the severity of the disease, but occasionally the symptoms did not develop until brought out by 'topping' the plants. Partial recovery of diseased Sakel cotton plants in the fields is not infrequent, and at least one case of complete recovery appears to have been observed. Out of three strains of Sakel cotton selected for resistance to the disease, two showed a high degree of comparative resistance, and a greater tendency to recover than ordinary strains.

Further experiments showed that the disease is readily transmitted by *B. gossypiperda* from Sakel cotton to bamia (*Hibiscus esculentus*), til (*H. cannabinus*), and karkade (*H. sabdariffa*), on which the symptoms resemble fairly closely those on Sakel. The virus is readily transmitted back from til to Sakel, but direct retransmission from bamia to Sakel has not yet been obtained; indirectly this has, however, been accomplished by passing the virus from bamia to til and thence to Sakel. The disease has also been observed in nature on garden hollyhocks, and a very similar one, with leaf curling, vein thickening, and foliar enations, occurs on tomatoes in Khartoum and the Gezira.

On the American Watts Long Staple cotton the disease when transmitted from Sakel by the whiteflies (needle inoculations gave negative results) develops in the form of a conspicuous mosaic, with none of the ordinary crinkle symptoms, except occasionally very faint traces which do not persist. The whitefly also readily transmits this mosaic to healthy plants of the same variety. No cases of complete recovery from mosaic were observed, but partial recovery is not uncommon. Attempts to transmit the leaf curl disease from bamia by means of the insect did not produce any symptoms on Watts Long Staple cotton, but typical mosaic developed when the plants were colonized with whitefles from diseased til. Although healthy Sakel plants, to which whiteflies from mosaic Watts Long Staple cotton were transferred, did not develop either crinkle or mosaic, evidence of the presence in them of the virus in a masked form was obtained from the fact that typical mosaic developed when whiteflies were transferred from them to healthy Watts Long Staple plants.

A list is given of a number of other varieties of cotton which were tested in the experiments. Some developed crinkle only, some mosaic only, and a few showed symptoms of both crinkle and mosaic in the same plant; on some, however, particularly Asiatic cottons, no symptoms were produced, and there was no indication that such plants behaved as carriers.

Observations on leaf curl in the Gezira indicated that during the 1930–31 season it spread earlier and faster, and its intensity was more severe than in the previous year, the loss caused by it being estimated at from one-half to one kantar per feddan. Apart from the development of resistant cotton varieties, the disease can only be effectively controlled by the suppression of the whitefly vector or of the initial source of infection early in the season. It is believed that the virus is carried from year to year mainly in the ratoon cotton plants which survive the 'dead' season and the

new growth on which is almost always crinkly, and steps are being taken to eradicate this source of infection.

McNamara (H. C.), Hooton (D. R.), & Porter (D. D.). **Cycles of growth in Cotton root rot at Greenville, Tex.**—*U.S. Dept. of Agric. Circ.* 173, 17 pp., 8 diags., 1931.

In continuation of the investigations of the cotton root rot disease (*Phymatotrichum omnivorum*) at the United States Cotton-breeding Field Station at Greenville, Texas [*R.A.M.*, ix, p. 306; cf. xi, p. 176], the authors discuss in some detail the behaviour of individual infection spots, mapped out from season to season since 1920. The spots pass through a period of some years of sustained development, and then in a single season break up into a few small isolated points, this process having no obvious relationship to the nature of the soil, the season, or the crop grown, but being apparently due to the behaviour of the causal fungus itself, possibly associated either with the life-history of the latter or some peculiar environmental conditions not yet understood. The small isolated points resulting from the breaking up serve to carry over the infection, and usually restart the latter with increased vigour. One of these isolated points of infection was apparently eradicated by digging out the diseased plant roots and the surrounding soil to a depth of 26 inches, and exposing the infected material to weathering on the surface of a disease-free area.

It is pointed out that the breaking up of the large spots indicates a weak point in the life of *P. omnivorum* and presents a favourable opportunity for the application of soil disinfectants and the planting of non-susceptible crops for several seasons with a view to reducing infection.

Holman (H. P.) & Jarrell (T. D.). **Waterproofing and mildew-proofing of Cotton Duck.**—*U.S. Dept. of Agric. Farmers' Bull.* 1157, 9 pp., 15 figs., 1931.

Mildew and sunlight are stated to be the chief causes of deterioration in cotton duck or canvas in the United States, where untreated material always mildews in warm weather if stored wet or even slightly damp. The resistance to mildew of the canvas may be increased by various treatments [*R.A.M.*, x, p. 733] tending to reduce the absorption of water, one coat of any of the following applied to each side having proved satisfactory: (1) 8½ lb. petrolatum (vaseline), 1½ lb. yellow refined beeswax, 5 lb. dry earth pigment (ochre, sienna, or umber), and 5 galls. volatile mineral spirits (painters' naphtha); (2) 7½ lb. medium hard petroleum asphalt, 2½ lb. vaseline, 1 lb. dry lamp-black, and 5 galls. mineral spirits; (3) 1 gall. boiled linseed oil, 2 lb. lamp-black, ground in linseed oil, and 1 pint Japan drier; (4) 1 gall. linseed oil, 1 lb. aluminium bronzing powder, and ½ pint Japan drier; (5) ½ lb. beeswax and 1 gall. spirits of turpentine.

Galloway (L. D.). **The formation of 'diamond spot' stains by mildew fungi.**—*Journ. Textile Inst.*, xxii, 10, pp. T494–T496, 5 figs., 1931.

This is a brief account of experiments which showed that the

'diamond' formation of mildew spots on cotton woven fabrics is not characteristic of any particular organism (a number of which were tested, including species of *Cladosporium*, *Helminthosporium*, *Fusarium*, *Aspergillus niger*, and *A. terreus* [cf. *R.A.M.*, x, p. 597]), and most probably depends on the weave of the cloth, the organisms growing more rapidly along the warp and weft than across the open spaces. This spot only occurred when the fabric was thoroughly damp and was incubated in a saturated atmosphere.

PETCH (T.). **New species of fungi collected during the Whitby foray.**—*The Naturalist, 1931*, pp. 101–103, 1931.

The new genus *Hymenostilbe*, represented by *H. muscarium* n. sp. on flies, is characterized by cylindrical clavae, parallel, joined, composite hyphae, usually not branched, cylindrical or clavate basidia, with a short sterigma (about 0·5 μ high) at the apex; and hyaline, continuous, single or occasionally concatenate conidia.

Notes on, and diagnoses of, the following are also given: *Sporotrichum isariae* n. sp. parasitic on *Isaria farinosa*; *Cephalosporium (Acrostalagmus) muscarium* n. sp. on flies attached to living leaves; *C. dipterigenum* n. sp. on a fly attached to a living leaf; *Spicaria (I.) swantoni* comb. nov. on bees.

CHEVALIER (A.) & DUFRÉNOY (J.). **Destruction du borer du Caféier (Apate monacha) par un champignon parasite.** [Destruction of the Coffee borer (*Apate monacha*) by a parasitic fungus.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xi, 120–121, pp. 738–740, 2 figs., 1931.

The senior author states that on the Ivory Coast of West Africa he frequently found adult individuals of the coffee stem-borer (*Apate monacha*) killed inside the galleries in the host by a parasitic fungus which, as described by Dufrénoy, is close to the genus *Spicaria*. It is characterized by long, tapering conidiophores bearing conidia measuring 8 to 10 by 3 to 4 μ and arranged in chains.

ALATORZEFF (A. P.). **Zur Frage der Dermatomykosis, hervorgerufen durch 'Torula epizoa Corda'.** [On the question of dermatomycosis caused by *Torula epizoa* Corda.]—*Arch. für Dermatol.*, clxiv, 2, pp. 279–284, 2 figs., 1931.

Torula epizoa Corda, which is characterized by concatenate hyphal segments of irregular diameter and round, yellowish spores, 6·5 to 8 μ in diameter, was isolated by the writer from the heads of two children in Leningrad suffering from trichophytosis of the scalp due to *Trichophyton tonsurans violaceum* [*T. violaceum*: *R.A.M.*, xi, p. 44]. In addition to the usual clinical picture of trichophytosis, small, flat, pink nodules were observed, presumably due to the associated *Torula epizoa*. The latter organism was also found causing a mild eruption of the skin of two dogs.

STERNBERG (C.). **Zur Kenntnis der Aktinomykose des Gehirns.** [Contribution to the knowledge of cerebral actinomycosis.]—*Zeitschr. für Hygiene- und Infektionskrankh.*, cxiii, 1 pp. 151–159, 6 figs., 1931.

Full clinical details are given of a case of primary cerebral actinomycosis examined by the author. The condition is stated to be extremely rare, only three other cases having been definitely assigned to this cause. The cyst in the third ventricle contained glandular, clavate, biscuit-shaped, or irregular structures, staining with eosin and Gram-positive, 40 to 120 μ in diameter, and uniting to form rosette-shaped, cruciform, or wheel-shaped bundles, interspersed with isolated remnants of the furcate hyphae of an *Actinomyces.* The fungus was evidently in a state of degeneration, of which glandular development is characteristic.

FRÓES (H. P.). **Mycetoma pedis (Madura foot) and its incidence in Brazil.**—*Journ. Trop. Med. & Hygiene,* xxxiv, 22, pp. 376–378, 2 pl., 1931.

The following fungi have been identified as causative agents of *Mycetoma pedis* in Brazil: *Nocardia* [*Actinomyces*] *bovis* [*R.A.M.*, x, p. 381] (the most frequent), *N. madurae, N. somaliensis, N. genesii* n. sp. (isolated by the writer in 1930 and characterized by very numerous, hard, red grains, 150 to 300 μ in diameter), *N. bahiensis, N. brasiliensis, N. pelletieri* n. sp. (hard, rouge vermilion grains, 400 to 500 μ in diameter), *N. africana* n. sp. (very hard, carmine red grains, 250 to 500 μ in diameter), *Indiella brumpti* [ibid., vi, p. 612], *Scedosporium apiospermum* [ibid., ix, p. 782], *S. magalhaesi, Madurella oswaldoi,* and *M. ramiroi.* Notes are given on the clinical and diagnostic aspects of the disease.

NEVES (A.). **Sobre um hiphomiceto isolado de lesões esporotrichoides da face: Spondylocladium atro-olivaceum n. sp.** [On a Hyphomycete isolated from sporotrichoid lesions on the face: *Spondylocladium atro-olivaceum* n. sp.]—*Mem. Inst. Oswaldo Cruz,* xxv, 4, pp. 323–331, 2 pl., 1931.

From the ulcerated facial lesions of a chauffeur who had met with a motor accident, the writer isolated a species of *Spondylocladium* characterized by deep olivaceous, finally black, smooth colonies; dark chestnut, septate, erect conidiophores, 34 to 55 μ in length; and dark chestnut, clavate, fusiform, ovoid or subovoid, 4-septate conidia, measuring 7 to 19·5 by 2 to 5 μ. The fungus, the cultural characters of which are given in some detail, is named *S. atro-olivaceum* n. sp., its relationship with *S. fumosum* and *S. atrovirens* [*R.A.M.*, viii, p. 804] being shown by means of a table.

REISS (F.). **Moniliasis cutis profunda.**—*China Med. Journ.*, xlv, 11, pp. 1037–1040, 2 pl, 1931.

Attention is drawn to the recent occurrence at a girls' home in Shanghai, of an epidemic of moniliasis affecting some 24 individuals at once. An undetermined species of *Monilia* was isolated from scrapings from lesions in the popliteal region at the back of the knees—the only part of the body involved. This is stated to be the first record of the occurrence of moniliasis in China, and it

is further of interest on account of the detection of the fungus in the deep strata of the skin [cf. *R.A.M.*, x, p. 663].

VAN HELL (W. F.). **Onderzoekingen over ziekten van Lelies.** [Investigations on Lily diseases.]—*Thesis, Univ. of Utrecht*, 116 pp., 4 pl., 9 figs., Baarn, Hollandia-Drukkerij, 1931. [English summary.]

A full description is given of a root and bulb rot of lilies occurring in Holland, the symptoms of which correspond in the main to those of the root decline of daffodils [*Narcissus pseudonarcissus*] and narcissi [*N. poeticus*] caused by *Cylindrocarpon radicicola* [*R.A.M.*, x, p. 795]. Diseased plants of *Lilium speciosum* vars. *album*, *roseum*, *rubrum*, and Melpomene, *L. umbellatum* and its varieties, *L. tigrinum*, *L. regale*, *L. croceum*, and others are stunted with abnormally small, pale green leaves, curling downwards, and poorly developed root systems. In advanced stages of infection the stems shrivel from the base upwards and the lowest leaves fall. The bulb scales are disintegrated and entirely rotted at the base. The roots are attacked in the early spring, the decay extending to the base of the bulb and thence to the disk and scales. If these bulbs are replanted the following year the disk is unable to form new roots, and the growing top produced during the rest period can only live for a short time on the stored reserves.

In addition to *C. radicicola*, the diseased roots and bulbs yielded various species of *Fusarium* and other fungi. Inoculation experiments [which are fully described] were carried out on several species of lily with *C. radicicola* from lily and daffodil, *Corticium solani*, and *F. solani*, of which the first-named was found to be definitely parasitic, the second may be so in certain cases, while the third is apparently saprophytic.

Cylindrocarpon radicicola (hyphae and chlamydospores) was found in the roots, disk, scales, and stem. The host cells react to the advance of the hyphae by the formation of conical papillae, surrounding the penetrating hyphae. When young, these papillae (the previous literature on which is summarized) consist of cellulose; subsequently they show typical cork and wood reactions.

Preliminary experiments in soil sterilization with formalin, as recommended by Gerretsen and his collaborators [ibid., x, p. 797], gave very satisfactory results, as did also laboratory tests in which one-year-old *L. regale* bulbs were immersed for 30 minutes in 2 per cent. formalin.

The so-called 'vuur' (blight), a destructive lily disease prevalent in Holland during cold, wet, spring weather, is due to *Botrytis elliptica* [ibid., xi, p. 108]. A non-sclerotial strain of *B. elliptica* was described by Marshall Ward as the cause of a lily disease (*Ann. of Botany*, ii, p. 319, 1888), and a similar strain was found by Miss Westerdijk and van Beyma thoe Kingma in Holland. The author, however, isolated from the affected plants examined by him a sclerotium-producing strain agreeing with that described by Wright [ibid., viii, p. 107]. Inoculation experiments with both strains on *L. regale*, *L. candidum*, *L. umbellatum* vars. *erectum* and Sappho showed that the one forming sclerotia is the more

virulent. *B. hyacinthi* caused severe infection of *L. candidum* [ibid., viii, p. 41].

Yellow flat occurs in Holland chiefly on *L. longiflorum* vars. *giganteum* and *formosum* imported from Japan via England [ibid., x, p. 668]. Various types of mosaic have been observed on *L. longiflorum*, *L. auratum*, and *L. speciosum*. The symptoms of both these diseases are described. The measures recommended for their control include roguing of infected plants, selection of healthy seed, destruction of aphids, and sanitary methods of cultivation.

A bibliography of 87 titles is appended.

HICKS (A. J.). **Gladiolus diseases.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 19–20, 1 pl., 1931.

An apparently serious infection of gladiolus corms by a *Botrytis* has been common in recent importations into Ottawa. The lesions [six types of which are clearly figured] are very typical, being straw-coloured at the centre, the colour deepening to brown at the outside, while the surface resembles a dried, tightly stretched skin, generally with a hole or crack showing where the diseased tissue has shrunk away from the suberized wall that usually separates the diseased from the healthy tissue. Black sclerotia 1 to 4 mm. in diameter are often present on the surface of the lesions. The causal organism has been isolated and is being studied.

MACLEOD (D. J.). **Aster wilt and Aster yellows investigations in disease resistance.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 22–23, 1931.

In 1930, 77 strains of asters were grown in New Brunswick in soil heavily infected with the wilt fungus (*Fusarium conglutinans* var. *callistephi*) [*R.A.M.*, ix, p. 510] and five of them, from Wisconsin, remained completely resistant. Of the others, the red strains appeared to be more resistant than the white, pink, and purple types.

FISHER (R.). **Eine wenig beachtete Dahlienkrankheit.** [A little-heeded Dahlia disease].—*Neuheiten auf dem Geb. des Pflanzensch., 1931*, 5, pp. 130–132, 1931.

In October, 1930, and July, 1931, the writer received for examination from Upper Austria specimens of dahlia leaves attacked by *Entyloma dahliae*, the symptoms, mode of infection, and control of which are briefly described. The first record of the fungus in South Africa is stated to date from 1911, and it has since been found in France, Belgium, Holland, Germany [and Switzerland: *R.A.M.*, ix, p. 409]; the writer has further detected its presence in Moravia [Czecho-Slovakia].

PAPE (H.). **Mosaikkrankheit bei Rhododendron.** [Mosaic disease of Rhododendron.]—*Gartenwelt*, xxxv, 45, p. 621, 1931.

Rhododendron leaves recently submitted to the writer for examination showed the typical blistering and mottling associated with mosaic in various other plants, but apparently not hitherto recorded on this particular host.

NEWTON (W.). **Infectious chlorosis of Roses.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 23, 1931.

During 1930, the symptoms of infectious chlorosis of roses [*R.A.M.*, ix, p. 385] did not appear in the field in British Columbia until the plants were well developed, but under greenhouse conditions they were visible much earlier, the characteristics upon Manetti roses being distinct from those upon Ulrich Brunner and Mrs. J. Laing. No symptoms of the disease were induced in Thornless Multiflora and Canina stocks through living unions with diseased Manetti, but La France bud shoots became infected through living unions with Multiflora when the latter were borne upon diseased Manetti root stocks. Diseased cuttings remained infected after one hour's immersion in water at 45° C. and after fifteen minutes' immersion in one per cent. potassium permanganate.

MADDEN (G. O.). **Verticillium wilt of Roses.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 24–25, 1 fig., 1931.

Verticillium wilt of roses was first observed in a local nursery in Ontario in 1928, since when the disease has attacked climbing and bush roses in various parts of the Niagara Peninsula. There may be severe defoliation and killing-back of the main branches and laterals or the leaves or only a few stems may wilt and fall. Isolations from stems and roots of affected plants almost invariably gave a *Verticillium*, root and stem inoculations with which gave positive results. The species was not identified, but as it produces sclerotia it belongs to the *V. dahliae* group [*R.A.M.*, xi, p. 130], and is probably a strain of *V. ovatum* Berkeley and Jackson [ibid., v, p. 564; ix, p. 6].

PAPE (H.). **Die Praxis der Bekämpfung von Krankheiten und Schädlingen der Zierpflanzen.** [The practice of control of diseases and pests of ornamental plants.]—x + 361 pp., 8 col. pl., 268 figs., 4 diags., Paul Parey, Berlin, 1932.

In this book the author has sought to place on a scientific basis the practical measures to be taken by nursery-gardeners in the control of the diseases and pests of ornamental plants (including flowering shrubs and trees for parks and roadways). The work is divided into two sections, viz., I (general), dealing with the economic importance and etiology of the diseases and pests of ornamentals, and their control by cultural, biological, and technical methods; and II (special), in which descriptive notes are given on (A) the general parasites (attacking numerous species and genera of plants); and (B) the diseases and pests of individual ornamentals in alphabetical order of the plants. The bulk of the treatise (from p. 108 onwards) falls under section IIB.

The book is illustrated by excellent coloured plates and a number of the text figures are original. A four-page bibliography, an index of scientific names, and an alphabetical subject index are appended.

Sampson (Kathleen). **The occurrence of snow mould on golf greens in Great Britain.**—*Journ. Board Greenkeeping Res.*, ii, 5, pp. 117–119, 1931.

During the past ten years the writer has examined samples of diseased turf (*Poa annua* and *Agrostis stolonifera*) from twelve different districts in the British Isles, and in six cases *Fusarium nivale* (*Calonectria graminicola*) was isolated from the brown patches ranging from an inch to a foot or more in diameter [*R.A.M.*, iv, p. 162]. This is believed to be the first record of the snow mould attacking grasses in England. The disease has been observed chiefly during the months October to February, but was once noticed at Bingley (Yorks) in June, 1931. Other fungi found associated with damage to lawns in England are a species of *Rhizoctonia*, probably identical with that causing brown patch in the United States [*Corticium solani*: ibid., x, p. 35], and *C. fusiforme*, which produces a burning effect on the grass [ibid., iii, p. 259].

Hurst (R. R.). **The resistance of varieties and strains of Clovers to mildew.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 183–184, 1931.

Powdery mildew of clovers (*Erysiphe polygoni*) has been found in every province in Canada and is particularly troublesome in Prince Edward Island each year. One year's observations of the reactions of 37 strains of red clover [*Trifolium pratense*] to the disease showed that 16 of them possessed definite resistance, strains 5 and 6 (from Quebec) being almost immune. A low-growing type from Oregon exhibited a high degree of tolerance, while the European varieties tested were quite resistant [*R.A.M.*, viii, p. 176].

Sanford (G. B.). **A study of the root rots of Sweet Clover in Western Canada.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 182, 2 figs., 1931.

In Western Canada part at least of the so-called winter killing of sweet clover [*Melilotus alba*: *R.A.M.*, vii, p. 302], common clover, and lucerne is caused by *Plenodomus meliloti* [ibid., x, p. 110]. The disease caused by the fungus is named 'brown rot' from the characteristic brown colour of the lesions in order to distinguish it from the softer, colourless rot produced by *Sclerotinia trifoliorum.* The latter has been found to be more serious in Alberta than first anticipated.

Paillot (A.). **Le traitement méthodique et rationnel des arbres fruitiers dans la région lyonnaise et les régions limitrophes.** [The systematic and rational treatment of fruit trees in the vicinity of Lyons and the adjacent districts.]—*Comptes rendus Acad. d'Agric. de France*, xvii, 28, pp. 951–954, 1931.

Under the joint auspices of the Chambers of Agriculture, the

agricultural bureaux, the agricultural services of the P.L.M. Railway Company, the agricultural syndicates, and the Station of Agricultural Zoology of the South-East, numerous very successful public demonstrations of the writer's method of combating the fungous and insect pests of fruit and walnut trees [*R.A.M.*, x, pp. 36, 214] have been given during 1931 in Rhône, Loire, Auvergne, and Isère. Pamphlets explaining the Bordeaux-anthracene oil treatment have also been issued by the regional authorities, and an exhibition of motor spraying and dusting apparatus was held at Vienne in November. Plans have been made for the continuation and extension of the campaign during the coming year.

CUNNINGHAM (G. H.). **Silver-leaf disease in the orchard.**—*New Zealand Journ. of Agric.*, xliii, 5, pp. 324–326, 1 fig., 1931.

After stating that in recent seasons silver leaf disease [*Stereum purpureum*] has become a serious problem in New Zealand orchards, most probably because the fruit-growers neglect the precautions recommended for its control, the author gives a brief, popular outline of the life-history of the causal fungus and of the measures best adapted for its suppression, based on the work of Brooks and his collaborators [*R.A.M.*, v, p. 502; xi, p. 59].

The fact that broom [*Cytisus scoparius*], which is abundant in most fruit districts, willows, poplars, tagasate [*C. proliferus*], and species of *Acacia* are readily infected by the fungus, makes the eradication of the sources of infection quite impracticable and protection must therefore be given by the dressing of wounded surfaces, for which purpose coal tar is stated to have given good results.

WEST (C.). **The cold storage of Apples.**—*Journ. Min. Agric.*, xxxviii, 6, pp. 585–593, 2 pl., 3 graphs, 1931.

This is a summary review of the work so far done in England in connexion with the low temperature and gas (artificial atmosphere) storage of apples, with more particular reference to the Bramley's Seedling variety. Most of the information given has already been noticed from time to time in this *Review*.

OSTERWALDER (A.). **Die Nectria-Kelchfäule an Aepfeln.** [The *Nectria* calyx rot of Apples.]—*Gartenbauwissensch.*, v, 5, p. 469, 1931.

In the autumn 1930, Golden Pearmain, Champagne Reinette, Overdiek's Reinette, and Boiken apples [in Switzerland] were found to be infected by a calyx rot due to a species of *Nectria* with spores closely resembling those of *N. galligena*, which had previously been observed on isolated fruits in 1914 and 1915. The only apparent difference in dextrose agar cultures lay in the somewhat shorter conidia with fewer septa of the calyx-rotting strain. In inoculation experiments the latter infected both wounded and unwounded fruits, whereas *N. galligena* was pathogenic only on injured apples. The calyx-rotting strain further produced cankers on one-year-old shoots of the Virginian Rose variety. Calyx rot was observed on Beauty of Boskoop and Glocken

apples in cold storage. The calyx-rotting organism is considered to be a strain of *N. galligena*, the exceptional virulence of which may be attributable to the very wet summer of 1930 [cf. *R.A.M.*, ix, p. 669].

BERG (A.). **The causative organism of a papular type of Apple measles.**—*Science*, N.S., lxxiv, 1924, pp. 485–486, 1931.

The writer's attention was first drawn to a papular type of apple measles [*R.A.M.*, ix, p. 157] in West Virginia in 1915, when only a few Red Astrachan trees were affected. The trunks and larger limbs presented a scurfy appearance, while the younger twigs, especially the water sprouts, were covered with small, well-defined papules. Negative results were given by all attempts to isolate an organism from these papules.

Frequent visits to the affected orchard each year since the first detection of the disease have enabled the writer to trace its spread from the Astrachan to the predominating Rome variety, passing over interplantings of Gano, Transparent, Chenango, Pound Royal, and Summer Queen. Two years ago the orchard was abandoned owing to the death of 16,000 trees from measles.

In 1929 a study was made of the disease in the Kanawha orchard, where the papular type was prevalent on Red Astrachan. Small Red Astrachan and Stark's Delicious trees, planted near large infected Red Astrachans, became severely infected the first season, but no causal organism could be isolated from the diseased material. In 1930, however, 34 out of 44 new papules on Red Astrachan yielded pure cultures of a slow-growing fungus which sporulated on oatmeal or malt-extract agar. Successful artificial inoculations were obtained in the greenhouse on young Red Astrachan trees during the past winter, and the fungus was readily reisolated from the lesions produced. Diseased apple twigs collected on 20th June, 1931, were placed in a moist chamber for 24 hours and spores were obtained by scraping the surface of the older lesions. The examination of freehand sections of the diseased spots showed the fungus to be a species of *Clasterosporium*, as yet undetermined.

MCLARTY (H. R.) & ROGER (J. C.). **Perennial Apple canker survey in the Okanagan Valley.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 108–111, 1931.

A survey to ascertain the distribution and severity of perennial canker of apples (*Gloeosporium perennans*) [*R.A.M.*, ix, p. 433; x, pp. 193, 675] in the Okanagan Valley, British Columbia, was begun in the autumn of 1928 and completed during the winter of 1929–30. The results obtained [which are tabulated] showed that the disease was most extensive and severe in the northern areas, and caused most damage in orchards which suffered from frost injury. The woolly aphis [*Eriosoma lanigerum*] was found throughout all the districts visited, except one where the absence of the disease, in spite of the coldness of the winters, substantiated the view that perennial canker can only exist where woolly aphis is present. The total number of trees infected, even slightly, was

less than 5 per cent., and since the completion of the survey control measures have materially reduced this figure.

SCOTT (C. E.) & STOUT (G. L.). **Tranzschelia punctata on cultivated Anemone in the Santa Clara Valley.**—*Monthly Bull. Dept. of Agric. California*, xx, 10–11, pp. 648–654, 2 pl., 1931.

Inoculation experiments [details of which are given] with aecidiospores of *Puccinia pruni-spinosae* [*R.A.M.*, xi, p. 186] from *Anemone coronaria* on almond, apricot, cherry, nectarine, peach, plum, and prune leaves resulted in the development of the uredo stage on all the hosts except cherry (seven varieties of which were tested). No teleutospores developed on the infected leaves. In certain parts of California the teleuto stage of the rust seems to predominate over the uredo, e.g., in the Santa Clara Valley on prunes, while in the Sacramento Valley the uredo stage occurs in epidemic form on peaches. It would appear from the writers' observations that the aecidial stage is probably more common on the Pacific Coast than has been generally supposed. *A. coronaria* was very severely attacked in 1931, the leaves being abnormally thickened, puffy, and rigid, and dying prematurely, so that the roots were weakened and useless for planting stock.

DIPPENAAR (B. J.). **Anthracnose of Almonds caused by Gloeosporium amygdalinum Brizi.**—*S. African Journ. of Sci.*, xxviii, pp. 267–273, 1 pl., 1931.

The writer's investigations on the anthracnose disease of almonds (*Gloeosporium amygdalinum*) in South Africa have already been noticed from another source [*R.A.M.*, xi, p. 115].

WILLISON (R. S.). **Peach canker investigations.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 116–120, 2 graphs, 1931.

In 1930, isolations were made from cankers of various ages on peach trees in the district of Niagara, Ontario. Young and incipient cankers on old trees yielded *Sclerotinia americana*, but in no case was this fungus found in cankers more than two years old. Several other organisms were isolated but only *S. americana* produced symptoms typical of canker in inoculations of fresh wounds on both young and old wood. A high percentage of cankers in young orchards (82 per cent. in one instance) were ascertained to originate from wounds and stubs due to careless pruning.

SMITH (C. O.). **Pseudomonas prunicola and Bacterium citriputeale.**—*Phytopath.*, xxi, 11, p. 1091, 1931.

The growth on dextrose-potato agar of a culture of *Pseudomonas prunicola* supplied by Wormald [*R.A.M.*, xi, p. 58] is stated closely to resemble that of the citrus blast organism, *Bacterium* [*P.*] *citriputeale*, and inoculations with the former through wounds in nearly ripe lemon fruits kept in a moist chamber produced within ten days typical black, pitted lesions identical in appearance with those caused by *P. citriputeale*, *Bact.* [*P.*] *syringae*, and *Bact.* [*P.*

cerasi isolated from California material. *P. prunicola*, therefore, is evidently very similar to, if not identical with, the organisms in question.

BANGA (O.). **Over ziekteverschijnselen van de Aardbei en over het voorkomen van een Actinomyceet in de weefsels van deze plant.** [On pathological symptoms of the Strawberry and on the presence of an Actinomycete in the tissues of this plant.]—*Meded. Landbouwhoogeschool te Wageningen*, xxxv, 5, 35 pp., 7 pl., 4 figs., 1931. [English summary.]

Strawberry plants on the experimental plots at Wageningen, Holland, showed symptoms corresponding to those described from England, the United States, and Canada under the names of 'small leaf', 'cauliflower disease', 'yellows', 'dwarf', and 'chlorosis' [*R.A.M.*, x, p. 42]. A regular feature of the abnormal condition was the occurrence of blister-like bubbles on the leaves, but attempts to transmit this symptom to healthy plants by means of filtered or unfiltered juice gave negative results. The tissues of diseased plants showed signs of phloem necrosis, brown cell walls with red margins in the phloem and vascular bundle sheath, a clouded yellow cell content of the affected tissues, and degeneration of the cell nuclei in the parenchyma surrounding the vascular bundles. Among the varieties affected by 'dwarf' (with blistering of the leaves) were Madame Montôt, Madame Lefèbre, Juliana, Leader, Barnes' Large White, Jucunda, Monarch, White Pineapple, and Deutsch Evern.

An acid-fast, Gram-positive Actinomycete was isolated from most of the petioles of affected plants examined and cultured on peptone-bouillon agar. The organism, which liquefies gelatine but does not decompose starch, consists of short rods (0·8 to 1 μ in length and about 0·5 μ in thickness) and hyphae measuring 1·3 to several hundred μ in length and 0·5 to 0·8 μ in thickness, the longer ones usually being branched. The larger, obtusely oval rods are often furnished with an extension of less sharply defined contours and somewhat more slender (0·4 μ) than the rod itself; these bodies are thought to be germinating spores.

Van Wisselingh's chitin test (*Jahrb. Wiss. Bot.*, xxxi, p. 619, 1897) proved very useful in the localization of the organism in the strawberry leaf tissues. The material for examination is heated for half-an-hour at 120° to 180°C. in potassium hydroxide to convert the chitin into chitosan, the presence of which is indicated by a reddish-purple to purple coloration on the application of 0·2 per cent. potassium iodide and some dilute sulphuric acid, after rinsing with alcohol and water. The rod-shaped organisms are readily detected in the stained preparations. It was found that all non-lignified cells of obviously diseased plants contain the Actinomycete, even apparently healthy leaves, the underground parts of the plant, the still folded shoots, and the seeds, whence it may pass into the seedlings.

The examination of apparently healthy strawberries revealed the presence of the same organism, and as the author failed to find any free from it, inoculation tests were not possible.

Some varieties of *Phaseolus*, the Duke of York potato, some

cucumber varieties, and the Ailsa Craig tomato (leaves and petioles) showed grains measuring 0·5 to 1·3 by 0·7 μ in the tissues. The chitin reaction was positive and culture experiments yielded an Actinomycete corresponding in morphological and physiological characters with that isolated from strawberries. The chitin test was further applied with positive results to the following: Golden Pippin apple, Beurré Hardy pear, Laxton's Prolific raspberry, Ogden's black currant, Mazagan broad bean [*Vicia faba*], White May turnip-top, French celery, Spanish round red pepper [*Capsicum annuum*], early Schietvrees Nunhem spinach, Nantes carrot, Lecerf cauliflower, and Egyptian red beet. The reaction given by red currant, Paragon III rhubarb, Primus Nunhem lettuce, Wonder of America peas, and yellow shallot [*Allium ascalonicum*] was very weak and purely local, while that of Yellow Zwijndrecht onion and some wild plants was negative.

WALKER (A. R.). **Strawberry root-rot studies.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 123–125, 1931.

In further investigations into strawberry root rot in Ontario [*R.A.M.*, ix, p. 433] 13·8 per cent. of the isolations made during winter and early spring gave a species of *Ramularia* and 58·6 per cent. a species of *Fusarium* [ibid., x, p. 254]. By the middle of June, however, the date when the disease had become common in the field during the last three seasons, *Ramularia* began to appear with considerable regularity and continued to outnumber the other organisms throughout the remainder of the season.

Inoculations of cuts made in individual strawberry roots under sterile conditions with the *Ramularia* resulted in the production of black root symptoms in each of 20 cases within four weeks, and the fungus was re-isolated from 18 of the successful infections. Similar inoculations with two strains of the *Fusarium* gave distinct blackening of the roots occasionally but not the typical peeling of the cortex. Inoculations made by immersing the roots in a suspension of *Ramularia* spores produced unmistakable black root symptoms in every case within four weeks, but those inoculated with the *Fusarium* showed no distinct symptoms of black root.

STRONG (F. C.) & STRONG (MIRIAM C.). **Investigations on the black root of Strawberries.**—*Phytopath.*, xxi, 11, pp. 1041–1060, 6 figs., 1931.

Black root of strawberries [*R.A.M.*, vii, p. 727] is stated to be widely distributed in the United States and is further reported to occur in Ontario, Canada. In Michigan, where the writers' studies were conducted, the reduction in stand may range from 5 to 60 per cent. Diseased plants are weakly and usually stunted. The roots are black, corky, and apparently dead, but in the earlier stages of the disease young white lateral roots may push out from the blackened cortical tissue. The affected cortex readily peels off, leaving the vascular cylinder white and apparently functioning. In younger plants the symptoms are more clearly defined. The leaves are smaller, and the main and lateral roots fewer, and either

completely rotted or marked with lesions which on the main roots are 0·5 to 5 cm. in length and usually encircle the root. At first they are reddish-brown and water soaked, later black, shrivelled, and sunken. During hot weather, the leaves of diseased plants wilt and become purplish or bronzed, the petioles turn red, the berries shrivel and hang green or semi-ripe on the stem, and the whole plant dies.

The infectious nature of the disease was determined by inoculation with strawberry débris, and fungus hyphae were constantly present in the lesions. The *Coniothyrium* stage of *Leptosphaeria coniothyrium* (*C. fuckelii*) [ibid., x, p. 117] and the *Hainesia* stage of *Pezizella lythri* (*H. lythri*) [ibid., x, p. 254] were frequently isolated from typically diseased roots and their pathogenicity proved on plants grown under controlled conditions. In several series of field inoculation tests [the results of which are summarized and tabulated] on runner plants rooted in clean or sterile sand, the typical symptoms were produced by each organism. Technical diagnoses of the two fungi are given in English.

Black root was not controlled by the treatment of the strawberry plants with standard fungicides before setting, and the elimination of infection would probably be best secured by suitable cultural measures, crop rotation, and the selection of resistant strains.

Berkeley (G. H.). **Suspected Strawberry mosaic.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 125–126, 1931.

Attempts made over a period of three years artificially to produce the suspected strawberry mosaic in Ontario [*R.A.M.*, viii, p. 354] gave consistently negative results. Seed from diseased Van Dyke plants gave a percentage of affected plants, indicating that the condition is seed-borne. In the field the trouble was invariably confined to the variety affected and did not spread to others adjacent, and the fact that only the new varieties are attacked suggests that the trouble may possibly be genetical in origin.

Simmonds (J. H.) **Soft rot (water blister) of Pineapples.**—*Queensland Agric. Journ.*, xxxvi, 4, pp. 394–398, 1 pl., 1 fig., 1931.

This is a popular account of an investigation of the soft rot (water blister) of pineapples in Australia, caused by *Thielaviopsis* [*Ceratostomella*] *paradoxa*, which has already been noticed from another source [*R.A.M.*, xi, p. 192].

Hockey (J. F.). **Co-operative investigation of fungicides of Apple orchards.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 106, 1931.

The iron sulphate-lime-sulphur mixture [*R.A.M.*, x, p. 256] for the control of apple scab [*Venturia inaequalis*] came into commercial use in Nova Scotia in 1930. In the mixture now recommended the calcium arsenate is increased to $1\frac{1}{2}$ lb. per 40 galls. water up to the fourth application, when the arsenate should be reduced to 3 lb. per 100 galls.

In 1930, comparative tests in Nova Scotia showed that the four spray calendars, Bordeaux mixture, lime-sulphur, aluminium sulphate-lime-sulphur [loc. cit.] and iron sulphate-lime-sulphur were equally efficient in the control of apple scab. Calcium arsenate was found to be essential fungicidally to both the aluminium sulphate and the iron sulphate mixtures, both of which reduced the burning caused by lime-sulphur. The iron sulphate mixture was a better carrier of calcium arsenate than was the aluminium sulphate mixture, and larger amounts of the arsenate could safely be used with it. While the aluminium sulphate mixture corroded the brass parts of the spray machine the iron sulphate mixture did not, no free hydrogen sulphide being generated. The spray residue in the iron sulphate mixture adhered so well that it is considered inadvisable to use this mixture after 1st July. Lead arsenate was not satisfactory with these two mixtures, either in adding to their fungicidal value or in preventing injury, and under the conditions prevailing in Nova Scotia smaller amounts of aluminium sulphate or iron sulphate than those recommended do not give satisfactory results. Neither mixture caused any degree of russeting at all comparable to that produced by Bordeaux mixture.

PITTMAN (H. A.). **Seed and seed-bed disinfection. Fundamental principles of plant disease control.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., viii, 3, pp. 394–403, 1 fig., 1931.

The main feature of this paper [which is meant to serve as a guide for practical growers] is a table showing the methods most commonly recommended for the disinfection of cereal, vegetable, and flower garden seeds. The paper also includes instructions for the preparation of mercuric chloride solutions and Cheshunt mixture, and brief recommendations for the disinfection of the soil in seed-beds by steam or fire, and by means of formalin.

MARTIN (H.) & SALMON (E. S.). **The fungicidal properties of certain spray-fluids. VIII. The fungicidal properties of mineral, tar and vegetable oils.**—*Journ. Agric. Sci.*, xxi, 4, pp. 638–658, 1931.

Continuing their study of the fungicidal properties of certain spray-fluids, as measured by their action on the conidial stage of *Sphaerotheca humuli* on the hop [*R.A.M.*, ix, p. 797], the authors give an account of tests in 1930 of a wide range of mineral, tar, and vegetable oils. When emulsified with 0·5 per cent. soft soap the following substances gave effective control of the fungus, without injury to the foliage of the host, namely, 2·5 to 3 per cent. summer solol (a proprietary preparation containing 61·6 per cent. by weight of high-boiling petroleum oils), 0·25 to 0·5 per cent. cottonseed oil (in one exceptional case this failed, however, to kill all the mildew patches at 1 per cent.), 0·25 to 0·5 per cent. sesame oil, 2 per cent. rape oil, 0·5 per cent. olive oil, 0·5 to 1 per cent. peach-kernel oil, and 2 to 4 per cent. castor oil. Adequate control was also afforded by 2 per cent. liquid paraffin and 2·5 per cent. volck (a proprietary preparation containing 80 per cent. by weight

of mineral oils) [ibid., ix, pp. 466, 790], when emulsified with soft soap, but these fluids are apt to cause injury to the leaves under certain conditions. Sternol insecticide (which contains 75·3 per cent. high-boiling petroleum oils) was almost fungicidal at 2·5 per cent. with 0·5 per cent. soft soap. All the tar oils tested were either non-fungicidal or injurious to the hop leaves.

WINKELMANN (A.). **Prüfung des Schwefelvernebelungsapparates 'Sulfurator'.** [Testing of the sulphur fumigation apparatus 'Sulfurator'.]—*Obst- und Gemüsebau,* lxxvii, 11, pp. 180–181, 3 figs., 1931.

Particulars are given of the construction and application of the Sulfurator sulphur fumigation apparatus (Rota-Werke, Aachen) which is intended to replace the Rota Generator, more especially for outdoor work [*R.A.M.*, viii, p. 548]. The apparatus consists of an oven with several openings and a lid closing by means of wedges, a container for the sulphur, and a bellows (hand or foot, as desired). After charcoal has been made red-hot in the oven, the sulphur is heated to a temperature of 450° C. and air slowly blown through with the bellows. The heated sulphur issues from the apparatus in a thick, yellow cloud, for the dispersal of which a period of 8 to 10 minutes is required, a similar time being necessary for the above-mentioned preliminaries. With 250 gm. sulphur a greenhouse of about 100 cu.m. can be treated. The sulphur is finely and uniformly dispersed and cannot be washed from the window-panes with a powerful hose. The small apparatus weighs about 9 kg., while the larger one, specially constructed for outdoor use, weighs some 40 kg. and holds 6 kg. sulphur which can be dispersed continuously at the rate of 10 kg. per hour. The larger machine is furnished with a movable chimney, so that the sulphur clouds can be turned in any direction. No technical defects were found in either apparatus in trials conducted at the Biologische Reichsanstalt. The cost of the small sulfurator is M. 63 and of the large one M. 320.

ARAGÃO (H. de B.). **Pesquizas sobre Phytomonas françai.** [Researches on *Phytomonas françai.*]—*Mem. Inst. Oswaldo Cruz,* xxv, 4, pp. 299–302, 2 pl., 1931. [German translation, pp. 303–306.]

The transmission of the flagellate *Phytomonas françai* [the genus name *Phytomonas* is sometimes used for the plant inhabiting flagellates referred to *Leptomonas* by other workers: cf. *R.A.M.*, i, p. 309] was effected by grafting cuttings of *Manihot palmata* containing the organism in the latex on to healthy ones, the incubation period being about ten days. The flagellate was also transferred from *M. palmata* to cassava (*M. utilissima*) by the same means. No difference was detected between infected and healthy plants, showing that in Brazil *P. françai* is innocuous to its hosts. So far no insect has been found to be implicated in the transmission of infection from plant to plant.

After considerable difficulty a small number of pure cultures of the flagellate were obtained on a modified Nöller's medium, in which human blood was substituted for that of rabbits. However,

as with other species of *Phytomonas*, the cultures remained viable only for two to three months, and further investigations concerning the optimum cultural requirements of the organism are indicated [cf. above, p. 237]. The dimensions of *P. françai* in culture are 10 to 25 by 2 to 3 μ (body only), the length of the flagellum being 5 to 8 μ.

ALCOCK (Mrs. N. L.). **Notes on common diseases sometimes seed-borne.**—*Trans. & Proc. Bot. Soc. Edinburgh*, xxx, 4, pp. 332–337, 1931.

This tentative list includes brief notes on the more common seed-borne diseases of a small range of vegetable and forage crops, and a few ornamental plants.

SATHE (T. R.) & SUBRAHMANYAN (V.). **The relation between seeds and micro-organisms.**—*Journ. Indian Inst. Sci.*, xiv A, 8, pp. 119–139, 1931.

A full discussion, supplemented by tables, is given of the writers' experiments at the Indian Institute of Science, Bangalore, to ascertain (*a*) whether specific micro-organisms occur in definite physiological association with seeds, and (*b*) whether such organisms, either individually or as a whole, exert any direct or indirect influence on seed germination and seedling development.

It is concluded that in the few cases in which the seed bore organisms the latter were fortuitous and without physiological significance. No harmful effect on germination or subsequent growth was detected.

NAOUMOFF (N. A.). Болезни овощных и садовых растений (с основами общей фитопатологии). [Diseases of vegetable garden and orchard plants (together with the elements of general phytopathology).]—382 pp., 151 figs., 11 maps, 5 graphs, Гос. Издат. С.-хоз. и Колхозно-Кооп. Литературы. [State Publishing Office of Agric. and Collective Farming Co-operative Literature], Leningrad, 1931.

In a preface to this book the author states that it is the outcome of many years of his pedagogic activity and is designed both for beginners and the more advanced student in phytopathology. For this reason, the work does not aim at giving an exhaustive list of the diseases of vegetable crops and orchard trees occurring in Russia, but those that are considered are dealt with in full detail in regard to their symptoms, and to the morphology and biology of the causal organisms and their relationship to the host. In the physiological diseases discussed, the causes from which they arise are treated at some length. A considerable portion of the book is devoted to theoretical and practical considerations of the problem of plant disease control, including the estimation of the damage done to the crops. Almost all the figures illustrating this work are original and well executed though poorly reproduced. The extensive and useful bibliography appended occupies 29 pages.

KLEBAHN (H.). **Fortsetzung der experimentellen Untersuchungen über Alloiophyllie und Viruskrankheiten.** [Continuation of the experimental investigations on alloiophylly and virus diseases.]—*Phytopath. Zeitschr.*, iv, 1, pp. 1–36, 2 figs., 2 diags., 1931.

Continuing his investigations on alloiophylly of anemones and other virus diseases [*R.A.M.*, vii, p. 797], the writer first conducted a series of tests to determine the nature of tobacco mosaic. The idea that the virus might be an enzymatic substance led to experiments [the technique of which is described] in its treatment with glycerine and alcohol, which showed that it resists the action of these substances for several days, conserving its virulence in a precipitated and air-dry condition for at least a month. The experiments are thought to suggest that the virus is non-living, but the objections to this view are set out.

Filtration experiments yielded the following tentative conclusions. Since an albumin-proof filter apparently retained the greater part of the virus, the virus particles must be larger than the albumin molecules used in the tests. Secondly, as the filtrate from a Congo red-proof filter caused a fair number of infections, the virus particles are presumably smaller than the Congo red molecules (about 40 $\mu\mu$), an observation agreeing reasonably well with Duggar's estimate for the tobacco mosaic particles of 30 to 35 $\mu\mu$ [ibid., ii, p. 133].

The tobacco mosaic virus was found to withstand heating up to 100° C., followed by immediate cooling, and also retained its virulence after ten minutes in water at 90°, gradually dropping to 70°. It further tolerated one second at boiling-point, but was destroyed by two to three seconds' exposure to this temperature. These observations are considered to indicate the 'non-vegetative' character of the tobacco mosaic virus.

Mosaic symptoms failed to develop on *Nicotiana glauca* as a result of inoculation with the tobacco mosaic virus, but in one instance the inoculation of tobacco with virus recovered from *N. glauca* proved successful.

Experiments were also conducted to ascertain whether the various types of potato mosaic are transmissible by ultra-filtered virus. Inoculations with aucuba mosaic failed. Crinkle was successfully transmitted, though the inoculated plants sometimes showed only mosaic. Ordinary mosaic and interveinal mosaic were also transmitted, but the latter gave either ordinary mosaic or crinkle in the infected progeny.

Grafting experiments were carried out in connexion with a study of *Abutilon* chlorosis [ibid., vii, p. 797 ; viii, p. 662]. *A. striatum* grafted on *A. thompsoni* and reciprocally became markedly chlorotic. Variegation also developed in *A. thompsoni* grafted on *A. darwinii*, in *A. venosum* on *A. thompsoni* and reciprocally, in *A. thompsoni* on *A. megapotanicum*, in *A. sellovianum* on *A. thompsoni* and reciprocally, and in *A.* 'Andenken on Max Hellwag' on *A. thompsoni*. The following double grafts were made. *A. thompsoni* was grafted on *A. striatum*, followed by *A. sellovianum* on the former ; *A. striatum* became quite variegated, but later this variety and *A. thompsoni* lost their mottling, whereas

this feature developed to a marked extent in *A. sellovianum*. *A. thompsoni* was grafted on *A. venosum*, followed by *A.* 'Goldenes Vliess', in which case *A. venosum* developed mottling but not the second graft. Chlorosis was further induced in *A. striatum* and *A. sellovianum* plants by intermittent contact with *A. thompsoni*, the cut surfaces of the stems being clamped together for six or seven days, released, the wounds shaved to expose new cells, and the stems rejoined; this process was repeated five or six times.

The results [which are fully described] of inoculation experiments on anemones with ground rhizomes and leaves, as well as with ultra-filtered expressed sap of diseased plants led to the tentative conclusion that the agent of alloiophylly resides in the soil or in the decaying remnants of infected plants on the surface of the ground. No evidence of insect transmission of the infective principle was obtained.

OLITSKY (P. K.) & FORSBECK (F. C.). **Concerning an increase in the potency of mosaic in vitro.**—*Science*, N.S., lxxiv, 1924, pp. 483–484, 1931.

Previous experiments by the first-named author indicated that multiplication of the tomato and tobacco mosaic viruses had occurred in the absence of living cells [*R.A.M.*, iv, p. 300]. These results, however, were not confirmed by the work of J. H. Smith and others [cf. ibid., vii, p. 749], and a fresh investigation was therefore conducted.

About 3,000 tomato plants, with several thousand controls, were used in a series of 30 tests, in six of which the original technique was followed as closely as possible, while in the remainder considerable modifications were made. The hydrogen-ion concentration of the media was kept constant by diluting one part of filtered fresh normal plant juice with 2·5 parts of Northrop's buffer (*Journ. Gen. Physiol.*, iv, p. 639, 1922) at P_H 5·3, the tests being made under aerobic or anaerobic conditions in the dark or sunlight. Fifteen experiments were carried out with Gates's U tubes (*Journ. Exper. Med.*, xxxv, p. 635, 1922). A collodion sac containing fresh, lightly crushed, young plants in buffer solution was inserted in one arm of the tube and buffer solution containing filtered virus was placed outside the sac, the medium within the latter being replaced one to seven times weekly. The tubes were kept at 28° C.

In nearly every case, irrespective of the method employed, there was some increase in the potency of the virus beyond the original titration, as was also observed by McKinney [ibid., viii, p. 189]. In the early experiments this increase was much greater than in the later ones, possibly on account of some cyclic variation in the virus. The question arises whether the increase was due to an activation or a dispersion of aggregated virus particles by some unknown mechanism, or whether it represented actual multiplication of a living agent. The latter interpretation cannot be definitely accepted on the basis of the present data.

Blattný [C.]. **Virové choroby.** [Virus diseases.]—*Ochrana Rostlin*, xi, 3–4, p. 138, 1931.

The author states that the year 1931 was marked by severe outbreaks of certain virus diseases of cultivated plants, which in former years were either rare or even unknown in Czecho-Slovakia. In one locality spinach suffered very heavily from yellows differing from the usual form in the severe deformation of the leaves which accompanied the characteristic discoloration. The disease is carried by the aphid *Aphis rumicis* [*R.A.M.*, ix, p. 428]. Cucumber mosaic, which for many years had not been reported, was severe in one commercial market garden. Mosaic of plum trees attained considerable economic importance, both in nurseries and orchards, but local varieties appeared to be much more resistant to it than imported varieties. Observations in nurseries showed that the disease is transmitted by pruning tools.

Phillips (J.). **The root nodules of Podocarpus.**—*S. African Journ. of Sci.*, xxviii, p. 252, 1931.

Material from four South African species of *Podocarpus* examined microscopically, and from two examined in culture by the author, showed the presence of *Pseudomonas* [*Bacillus*] *radicicola* [*R.A.M.*, x, p. 398] Fungal mycelium was confined to the outer cortical tissues of nodules over a season old. Seedlings of *Podocarpus latifolius* and *P. falcatus* grown in sterilized soil without nodules were feeble and succumbed early, while those in non-sterilized soil with nodules developed normally. The watering of seedlings in sterilized soil with a bacterial infusion enabled the plants to form nodules and make vigorous growth. In the material examined, therefore, *B. radicicola* was evidently of greater importance in the growth of *Podocarpus* than the mycorrhizal fungus.

Tucker (J.). **Potato inspection and certification service.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 161–166, 1931.

In 1930, 9,707 fields comprising 34,305 acres were inspected for potato certification in Canada [cf. *R.A.M.*, x, p. 745], representing an increase of 2,275 acres over the figure for 1929. Approximately 81 per cent. of the total acreage inspected passed the two field inspections required for certification, the best record in this respect that has yet been attained in Canada. Altogether 2,411 fields or 24·82 per cent. of the total number of fields inspected were rejected. Mosaic was responsible for the rejection of 1,278 fields, or 53 per cent., and blackleg [*Bacillus phytophthorus*] for 227 fields; the latter is a slight increase over the previous year's figures.

Leach (J. C.). **Blackleg disease of Potatoes in Minnesota.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 76, 36 pp., 15 figs., 1 map, 1931.

A full account is given of the blackleg disease of potatoes in Minnesota which is stated to cause an average annual loss of 2 per cent. of the crop, while in some fields the losses may amount to 50 per cent. or more. Heavy damage may also be sustained from this cause by potatoes stored under suitable conditions.

The author regards the causal organism of this disease [*Bacillus phytophthorus*] as identical with *Erwinia carotovora* [*Bacillus carotovorus*] and from a comparative study of allied organisms now adds *B. oleraceae* Harrison, *B. omnivorus* van Hall, and *B. apiovorus* [*R.A.M.*, iii, p. 263] to the list of synonyms of this species previously reported [ibid., x, p. 125].

There are at least three distinct sources of infection, viz., systemic infection of seed tubers, direct infection of the seed pieces by bacteria from the soil, and infection following the attack of seed pieces by the seed corn maggot (*Hylemyia* [*Phorbia*] *cilicrura*) [ibid., x, p. 619]. The action of the bacteria on the potato tissues is essentially the same as that of the soft rot of other plants. The control of the disease is somewhat complicated, being dependent on a number of variable factors, but the losses may be reduced to a minimum by certain cultural practices, including the use of certified seed, disinfection of seed tubers, the planting of seed pieces as soon as possible after cutting them, and crop rotation.

MacLeod (D. J.) & Hurst (R. R.). **Testing effect of new chemical substances on the control of tuber diseases.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 155–156, 1931.

In further tests conducted during 1930 in Prince Edward Island on the control of potato scab [*Actinomyces scabies*] by various seed treatments [*R.A.M.*, ix, p. 435], the best control (under 5 per cent. severe infection) was given by Du Bay 738 and 664, sanoseed, hot mercuric chloride, hot formaldehyde, Du Bay 694 and Cal K. The results in general confirmed those of previous seasons, further demonstrating that seed treatment can be depended upon only as giving partial control of *A. scabies* or *Rhizoctonia* [*Corticium solani*], effective control of which necessitates combining seed treatment with cultural practices designed to correct soil and other conditions which predispose to these diseases [ibid., x, p. 748].

Hurst (R. R.). **Date of digging Potatoes in relation to degree of infection with Rhizoctonia.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 150–153, 1931.

In a test made on Prince Edward Island in 1930 to ascertain the effect of the date of digging upon infection of Green Mountain and Irish Cobbler potatoes by *Rhizoctonia* [*Corticium solani*] it was ascertained that when dug on 1st September neither variety became affected, but infection increased with each subsequent date of digging after about the middle of September. Digging on 8th September resulted in the Green Mountain tubers showing no disease and the Irish Cobbler tubers only 1 per cent. infection; by 15th September the corresponding figures for the two varieties were 3 and 7 per cent. respectively, and by 13th October they were 41 and 75 per cent. Infection was abundant although the weather was warm and dry.

The beneficial effects of early digging are important to growers of potatoes for seed certification. The saving effected in time and labour together with the higher percentage of clean seed obtained

compensated for any loss entailed through mechanical injuries and reduced yield.

CHAMBERLAIN (E. E.). **Corticium disease of Potatoes. II. Induced dormancy and tuber-injury resulting from seed treatment.**—*New Zealand Journ. of Agric.*, xliii, 5, pp. 350–356, 1 fig., 1 graph, 1631.

Continuing his investigations of the *Corticium* [*solani*] disease of potatoes in New Zealand [*R.A.M.*, xi, p. 201], the author gives details of experiments to ascertain the effect on the viability of seed tubers of their treatment by the acidulated corrosive sublimate method recommended for general use in the Dominion, and consisting in dipping the tubers for 90 minutes in a solution of 1 part mercuric chloride, 6·6 parts concentrated hydrochloric acid in 1,000 parts water [cf. ibid., vi, p. 115; x, pp. 203, 268]. The results of the tests (in which varying concentrations of the solution were used) showed that 75 minutes in the solution recommended did not cause pitting of the tubers (Epicure variety), but after 90 minutes there was slight pitting. The severity of the pitting, varying from slight depressions of the tuber surface at the lenticels or any wounds to destruction and discoloration of the tissue in the vicinity of the pits, increased with the concentration of the solution. Germination tests showed that where severe pitting had resulted, the treatment had brought about an induced dormancy of the 'eyes' and had also killed off all the 'eyes' of some of the tubers. There was evidence that seed-size tubers were more severely affected by the treatment than larger sized tubers which were cut before planting, and that various potato varieties react differently to the treatment [cf. ibid., viii, p. 332], Majestic being among the most susceptible, and Herald, Up-to-date, and Epicure very resistant.

Further tests to determine the most suitable time to treat the seed tubers showed that, in order to avoid damage, the treatment should be carried out ten weeks before planting, but if delayed it should then be given immediately prior to sowing, as this tends to minimize the injury. During the past three years large quantities of seed potatoes were treated by this method at the Ashburton Experimental Farm about four months before planting, and although a certain amount of pitting occasionally occurred, in no case did the treatment affect either the germination or the growth of the plants.

BRETHENOUX. **Le Rhizoctone de la Pomme de terre.** [Potato *Rhizoctonia*].—*Journ. d'Agric. Prat.*, N.S., xcv, 45, pp. 369–370, 1 fig., 1931.

A brief, popular account is given of the *Rhizoctonia* disease of potatoes [*Corticium solani*], which is stated to have occurred on a large scale in France during the current season. Growers are particularly recommended to disinfect seed procured from Holland with 500 gm. formol per 100 l. water, the use of the more efficacious corrosive sublimate being prohibited in France [cf. *R.A.M.*, ix, p. 234]. A period of four years should elapse before potatoes are replanted in soil that has once been infested by the fungus. Other preventive measures are briefly indicated.

KÖHLER (E.). **Zur Biologie und Cytologie von Synchytrium endobioticum (Schilb.) Perc.** [On the biology and cytology of *Synchytrium endobioticum* (Schilb.) Perc.]—*Phytopath. Zeitschr.*, iv, 1, pp. 43-55, 17 figs., 1931.

A detailed account is given of the author's biological and cytological studies on the causal organism of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xi, p. 69], comprising zygote formation, penetration of gametes and zygotes into the host tissues, nuclear relations of gametes and zygotes, and development of the fungus in the host cell.

ŘÍHA (J.). **O významu zkoušky klíčivosti pro zjišťování zdravotního stavu hliz Bramborových.** [The significance of sprouting tests in the establishment of the health of Potato tubers.]—*Ochrana Rostlin*, xi, 3–4, pp. 103–114, 2 figs., 1931. [German summary.]

Some details are given of observations and experiments in 1923–24 and 1929–30 at the Agricultural Experiment Station of Valecov, Czecho-Slovakia, for the purpose of determining whether the presence in potato seed tubers of outwardly unrecognizable diseases, and more particularly of virus diseases, could be detected by means of tuber sprouting tests. The results showed that mosaic-diseased tubers sprout somewhat earlier than normal, and their sprouts grow a little faster than those of healthy plants. Leaf roll and healthy tubers begin to sprout almost simultaneously, but the sprouts of the former develop somewhat more slowly than those of the latter. Tubers from hills infected with blackleg [*Bacillus phytophthorus*] start sprouting somewhat later than healthy ones, and the sprouts develop more slowly. The general indications are, however, that these differences are too small to serve for diagnostic purposes, the more so as considerable variations also occur in the start and further development of the sprouts in individual tubers of even the same potato variety.

COSTANTIN (J.), LEBARD (P.), & MAGROU (J.). **Influence du séjour en montagne sur la productivité de la Pomme de terre.** [Influence of a period of growth in the mountains on the productivity of the Potato.]—*Comptes rendus Acad. des Sciences*, cxciii, 20, pp. 902–906, 1 fig., 1931.

Brief details are given of a small range of experiments in which part of the tubers from the same hills of healthy (Triumph and Imperia) and leaf roll (Belle de Juillet, Royal Kidney, and an unnamed variety collected at an altitude of 1,280 m.) potato varieties were grown in 1930 in the plain, and the other part at an altitude of 1,650 m., and the progeny of both lots was then tested in 1931 for yield in the vicinity of Paris [*R.A.M.*, x, p. 266]. The results showed that on fertile, manured, and well cultivated soil, the progeny of the healthy varieties kept for one year in the mountains was conspicuously more vigorous, matured 4 or 5 days earlier, and had a markedly heavier yield (by 27·3 per cent. for Triumph and 61·1 per cent. for Imperia), than that of the plants kept in the plain. This effect was much less pronounced on sandy, non-fertilized, and

poorly cultivated soil, and there was some indication that it may not be maintained the second year of cultivation in the plain. The cultivation for one year in the mountains did not appear to be of any great significance in the case of the leaf roll varieties, the yield of which was but slightly increased on the poorer soil.

CHIAPPELLI (R.). **Il brusone e l'equilibrio della concimazioni.** [' Brusone' and the balance of fertilizers.]—*Giorn. di Risicolt.*, xxi, 11, pp. 173–176, 1 fig., 1931.

The writer has found that the addition of potassium chloride to a fertilizer consisting of farmyard manure, superphosphate, and ammonium sulphate not only prevents the development of the 'brusone' disease of rice [*R.A.M.*, xi, p. 202], but cures mild cases. In one test the yield was augmented from 3·17 to 4·36 quintals per 950 sq. m. (equivalent to an increase of 45·90 over 33·35 quintals per hect.) by the use of this substance. A similar action was exerted by ferrous sulphate.

CRAIGIE (J. H.). **An experimental investigation of sex in the rust fungi.**—*Phytopath.*, xxi, 11, pp. 1001–1040, 14 figs., 1931.

A comprehensive account is given of the author's studies on the sexual behaviour of two rusts, *Puccinia graminis* and *P. helianthi* [*R.A.M.*, x, p. 365].

Details are given of an apparatus by which single sporidia can be picked off their sterigmata, and two methods of inoculation are described enabling both mono- and bisporidial pustules to be obtained.

Pycnidia developed on the upper side of each pustule of *P. graminis* and *P. helianthi*. Both rusts are heterothallic, the monosporidial pustules being of two sexes (+) and (−), which occur in approximately equal numbers indicating a differentiation of the sexes in the sporidia.

A large majority of the monosporidial pustules of *P. graminis* and *P. helianthi* failed to produce aecidia [cf. ibid., x, p. 784], those that did so being possibly due to the accidental mixture of their nectar by handling or through the agency of insects. About half the compound or bisporidial pustules of both rusts produced aecidia.

The intermixture of the nectar of monosporidial pustules of *P. graminis* or *P. helianthi* induces aecidial formation in the pustules thus treated in five to six days. Flies are active agents in carrying the nectar with pycnospores from one pustule to another. Nectar of a (+) pustule applied to the pycnidia in one part of a (−) pustule induces aecidial formation in the region to which it is applied, but rarely beyond. From one of the aecidial cultures of *P. graminis* a new physiologic form was isolated and designated as No. 57 by Stakman and Levine [ibid., x, p. 15].

Some evidence of heterothallism was also obtained in *P. coronata* [*P. lolii*], *P. pringsheimiana*, and a species of *Gymnosporangium* (? *G. corniculans*) on *Amelanchier alnifolia*.

Two methods are described whereby a cross may be made

between two physiologic forms of a heterothallic rust producing pycnidia and aecidia.

A bibliography of 90 titles is appended.

Cunningham (G. H.). **The rust fungi of New Zealand together with the biology, cytology and therapeutics of the Uredinales.**—xx + 261 pp., 3 pl., 175 figs., Dunedin, N.Z., J. McIndoe, 1931.

This very useful and handy volume is the outcome of many years' continuous study of the rust fungi [*R.A.M.*, x, p. 343]. The first part of the work comprises a condensed survey of present knowledge of the biology of the rusts, while the second covers the taxonomy of all species known to occur in New Zealand. The following are the main headings under which the subject is discussed: morphology and cytology of spore forms; germination and viability of the spores; entry and penetration of the host; dissemination and perpetuation of the rusts; parasitism; biologic and physiologic specialization; therapeutics; evolution of families and genera; technique; classification of the Uredinales; and systematic position of New Zealand rusts. Most of the figures are original. A bibliography of 21 pages is appended.

Waksman (S. A.) & Diehm (R. A.). **On the decomposition of hemicelluloses by microörganisms. I. Nature, occurrence, preparation, and decomposition of hemicelluloses. II. Decomposition of hemicelluloses by fungi and Actinomyces. III. Decomposition of various hemicelluloses by aerobic and anaerobic bacteria.**—*Soil Sci.*, xxxii, 2, pp. 73–139, 7 graphs, 1931.

A detailed and fully tabulated account is given of the writers' investigations in New Jersey on the mode of decomposition of the hemicelluloses in plant tissues by soil micro-organisms [cf. *R.A.M.*, xi, p. 3].

All the fungi tested, including *Actinomyces* spp., *Zygorrhynchus* sp., *Rhizopus* sp., *Penicillium* sp., *Trichoderma* sp., *Humicola* sp., *Cunninghamella* sp., *Aspergillus niger*, and *A. fumigatus*, proved capable of decomposing mannan, xylan, and galactan, the last-named substance being the most resistant. The actinomycetes were particularly active in the process of disintegration under favourable cultural conditions. Both fungi and actinomycetes liberate considerable quantities of carbon dioxide in the course of destruction of the hemicelluloses, while the former also produce small amounts of organic acids.

Generally speaking, the micro-organisms decomposing the hemicelluloses are less specific than those attacking the celluloses, the xylans, pentosans, and mannans being liable to destruction by a great variety of common soil flora. No attempt, therefore, has been made to describe new types of organisms responsible for the decomposition of these carbohydrates, a procedure that would involve the isolation and study of hundreds of species. The micro-organisms causing hemicellulose decomposition require available sources of nitrogen for the synthesis of their microbial

cell substance, just as cellulose-decomposing bacteria do [ibid., v, p. 763].

LE CLERG (E. L.). **Distribution of certain fungi in Colorado soils.**—*Phytopath.*, xxi, 11, pp. 1073–1081, 1931.

The results [which are discussed and tabulated] of an examination of 13 different types of Colorado soils [*R.A.M.*, vii, p. 740] showed that *Fusarium* spp. are more widely distributed and occur with greater frequency than any other fungi, constituting 23 per cent. of the total flora found in all the 226 samples investigated. *Penicillium humicola* came next in order and *Trichoderma lignorum* third. Species of *Aspergillus* and *Penicillium*, especially *P. expansum* and *P. digitatum*, were also extensively encountered in beet soils. *Sepedonium chrysospermum* was found exclusively in sugar beet soils; this organism has only twice before been reported from the soil, once in England (*Ann. Myc.*, xii, p. 32, 1914) and once in New Jersey (*Soil Sci.*, iii, p. 565, 1917).

Species of *Fusarium* were found in all the samples of gladiolus soil examined, and comprised 30 per cent. of the entire fungal flora. The fields in question had produced plants showing marked symptoms of root rot due to *F.* sp. the previous year [cf. ibid., ix, p. 700]. *T. lignorum* and *P. citrinum* were also prevalent in these soils.

Maize soils contained a larger variety of fungi than any of the other soils investigated, 21 species being isolated.

P. expansum and *F.* spp. were isolated from each of the 30 samples of potato soil examined, the former constituting 54 and the latter 25 per cent. of the total flora.

Nineteen species of fungi (including seven of *Penicillium*) were isolated from 15 samples of winter wheat-growing soils. *F.* spp. were found in all the samples and formed 23 per cent. of the total flora.

F. spp. were very prevalent in the 19 samples of alkali soils, comprising 24 per cent. of the total flora, while *P. expansum* formed 44 per cent. These organisms were also the most abundant at a soil depth of 6 to 12 in. At a depth of 3 ft. below the surface *F.* spp., *P. expansum*, *Absidia spinosa*, and *Alternaria* spp. were found, and at 6 ft. *F.* spp. and *Absidia spinosa*.

DODDS (H. H.). **The work of the Natal Sugar Experiment Station.**—*South African Sugar Journ.*, xv, 11, pp. 705, 707, 709, 711, 1931.

The sugar-cane varieties P.O.J. 2714, 2725, 2727 are proving valuable in Natal, while among the 18 selections from the Indian Government Cane Breeding Station, Coimbatore, now undergoing trial at Mount Edgecombe, Co. 290 shows special promise in respect of resistance to disease and other desirable characters. Owing to the risk of introducing destructive diseases and pests on sugar-cane cuttings, these may be imported into South Africa only by the Sugar Association. After fumigation the plants are grown for a year or longer in an insect-proof quarantine greenhouse at Durban.

ORIAN (G.). **Les galles des tiges de la Canne à Sucre à Maurice.** [Stem galls of Sugar-Cane in Mauritius.]—*Rev. Agric. de l'Île Maurice, 1931*, 58, pp. 131–133, 1931.

In 1926, the author observed for the first time in Mauritius several instances of a peculiar condition of sugar-cane known as 'bunch-top' in Hawaii [*R.A.M.*, ix, p. 341] and considered by Lyon as analogous to the disease termed 'stem galls' (*Hawaiian Planters' Rec.*, xxx, 4, pp. 492–506, 1926). In 1930, numerous minute galls were noted on some of the youngest internodes of a stem of R.P. 6 cane and in February, 1931, specimens of P.O.J. 2878, a variety recently introduced into Mauritius, were received showing protuberances on the stems definitely recognized as galls. They consisted in irregularly and variously shaped excrescences on the stem near the node or on the internode. Occasionally they were found on the entire circumference and were sometimes rather large, in which case they often formed numerous adventitious buds which gave rise to a more or less compact bunch of shoots, with a witches' broom appearance. Apart from the galls, the stems appeared quite healthy.

As the cause of the condition has not yet been ascertained, growers are recommended to deal with bunch-top as if it were infectious.

TIMS (E. C.) & EDGERTON (C. W.). **Behavior of mosaic in certain Sugar-cane varieties in Louisiana.**—*Amer. Journ. of Botany*, xviii, 8, pp. 649–657, 1931.

The writers discuss and tabulate the results of their studies in Louisiana on the varying degrees of resistance to mosaic shown by different sugar-cane varieties. In old varieties, such as D. 74 and Louisiana Purple, which show little or no tendency to recover from the disease [*R.A.M.*, x, p. 689], strains have gradually been selected that show the mosaic symptoms only in the mildest form. Of the four P.O.J. varieties used in the investigations, P.O.J. 36 and 234 were found to be quite susceptible, while P.O.J. 213 and 228 may be classed as resistant. The relative resistance of these varieties is regarded as largely due to the capacity of the plants to throw off the disease and produce buds free of the virus. The comparatively resistant P.O.J. 213 and 228 produce a much greater number of healthy shoots from infected stalks than do the more susceptible P.O.J. 36 and 234, while the disappearance of the mosaic symptoms during the summer months in the field is also more common in the two former varieties.

BRANDES (E. W.). **Breeding for resistance to mosaic.**—*Facts about Sugar*, xxvi, 11, pp. 490–491, 493, 3 figs., 1931.

Among the accessions of the Papua expedition of the United States Department of Agriculture in 1928 [*R.A.M.*, viii, p. 133; x, p. 643] are a number of varieties of the new sugar-cane species provisionally named *Saccharum robustum* Jeswiet, a marked characteristic of which appears, from field observations, to be freedom from mosaic coupled with vigorous growth. The disease was found to occur in Papua in several varieties of *S. officinarum* [ibid., viii, p. 132] and was also fairly common in *Coix lachryma-jobi*.

Recent controlled breeding experiments have indicated that the natural hybrid Kassoer is probably a cross between *S. spontaneum* and the Zwart Cheribon (Louisiana Purple) variety of *S. officinarum*. Some of the Papuan varieties give evidence of being natural hybrids of *S. robustum* × *S. officinarum*. The largest variety of the Papuan wild cane group, viz., 28 NG. 251, readily contracted mosaic when exposed to natural infection in Porto Rico. Resistance to mosaic appears to be governed by multiple factors. In the cross *S. barberi* (Chunnee) × *S. officinarum* (Cheribon), both of which are susceptible to mosaic and not specially tolerant, the F_1 generation produced numerous individuals like P.O.J. 213, quite acceptable from a commercial standpoint in respect of mosaic tolerance.

The cross *S. spontaneum* (immune) × *S. officinarum* (susceptible) has, in the writer's experience, always yielded apparently immune seedlings in the F_1 and a high proportion of similar material in the F_2. In the latter generation exposed to natural infection in Louisiana in 1922, 9 out of 650 seedlings contracted mosaic, while only 2 out of 70 became diseased under similar conditions in 1924. Susceptibility to mosaic would appear from these data to be recessive in this particular cross, though the occurrence of the disease in Co. 205, an F_1 hybrid of *S. spontaneum* × *S. officinarum*, has been reported in India [ibid., ix, p. 430] and Florida. On the basis of present knowledge it would appear that the most rapid improvement of the sugar-cane will be effected by further back-crossing on the already available hybrids of *S. spontaneum* × *S. officinarum*. Commercial resistance, combined with high cane weight and sucrose content, is found in many of the resulting seedlings, as well as in some of those derived from crosses in which both parents are susceptible.

Roldan (E. F.). **The non-infectious twisted or tangled top disease and pokkah-boeng of Sugar Cane in the Philippine Islands.**—*Sugar News*, xii, 10, pp. 726–728, 1931.

Careful microscopic and cultural investigations having failed to reveal the presence of an organism in P.O.J. 2878 sugar-cane plants from Laguna affected by twisted or tangled top [*R.A.M.*, ix, p. 341], this disease is attributed to physiological causes. Observations have shown that the twisting and chlorosis are prevalent on rapidly growing canes about three months old during severe drought in April and May.

Another form of tangled top disease, the so-called pokkah-boeng, also occurring on P.O.J. 2878 in Laguna and Pampanga, has been found to be due to a species of *Fusarium* differing from *F. moniliforme* [*Gibberella moniliformis*] in the capitate arrangement of its conidia and resembling that described by Tucker from Porto Rico [ibid., ix, p. 291]. Inoculation experiments with mycelial and spore suspensions of this organism were carried out on the leaf spindles and growing points of the plants and resulted in complete twisting and tangling of the leaves with the former method and rotting of the top with the latter. The symptoms could not be induced, however, by pouring suspensions of the fungus on the

tops of healthy plants, a fact denoting that the species in question is only weakly parasitic.

VERWOERD (L.). **A preliminary list of fungi from the Bloemfontein district of the Orange Free State.**—*S. African Journ. of Sci.*, xxviii, pp. 298–301, 1931.

A list is given of 152 species of fungi belonging to 83 genera occurring in the Bloemfontein district of the Orange Free State, which is stated not to have been previously explored from the mycological standpoint.

DIPPENAAR (B. J.). **Descriptions of some new species of South African fungi and of species not previously recorded from South Africa—II.**—*S. African Journ. of Sci.*, xxviii, pp. 284–289, 1931.

Phoma zantedeschiae n. sp. is characterized by black, subepidermal, globose pycnidia, 90 to 160 μ in diameter (or depressed, 90 to 144 by 150 to 244 μ) and hyaline, oval or elliptical, unicellular pycnospores, 3 to 3·5 by 6 to 8 μ; it forms elongated, sunken, dark brown spots with greyish centres on the flower stalks and green parts of the spathe of *Zantedeschia aethiopica.*

Phyllosticta brassicae [*Phoma lingam*: *R.A.M.*, vii, p. 71] was observed forming discoloured spots with a bluish zone on cabbage leaves at Stellenbosch in August, 1930.

Septoria cercosporoides and *S. pyricola* have been found on the leaves of *Chrysanthemum leucanthemum* and Kalbas pears, respectively.

Rye leaves were attacked by *Heterosporium secalis* n. sp., which forms elongated, straw-coloured blotches and is characterized by dark brown, simple, slightly flexuose, amphigenous conidiophores, 6 to 8 μ thick and up to 95·5 μ long, forming pulvinate tufts, and acrogenous, fuscous, elongated, minutely echinulate, uni- to biseptate conidia, 6·8 to 9 by 42·5 to 59·5 μ.

Pleospora camelliae n. sp. forms grey of buff-coloured, oval to circular spots with a brown zone on *Camellia japonica* leaves in association with *Macrosporium camelliae.* Its perithecia are black, amphigenous, and measure 259 to 295 by 185 to 222 μ; the asci cylindrical, shortly pedicellate, measuring 102 to 127·5 by 22 to 27 μ, and containing eight 7-septate, distichous, yellowish-brown, oblong, muriform ascospores, 27 to 34 by 10 to 15 μ; numerous hyaline paraphyses are present.

Taxonomic notes are given on a number of other new or recently recorded species.

VERWOERD (L.) & DU PLESSIS (S. J.). **Descriptions of some new species of South African fungi and of species not previously recorded in South Africa—III.**—*S. African Journ. of Sci.*, xxviii, pp. 290–297, 1931.

Among other new species of fungi and fresh records for South Africa [cf. *R.A.M.*, x, p. 408] the following may be mentioned. *Gloeosporium sansevieriae* n. sp. forms buff-coloured spots with a

chocolate-reddish margin on the leaves of *Sansevieria zeylanica*, large parts of which may be destroyed. The acervuli are amphigenous and 266 to 560 by 168 to 280 μ; the thin, needle-shaped conidiophores measure 1·6 μ in diameter and bear ovoid to subcylindrical, hyaline conidia, 11·2 to 20·8 by 4·8 to 6·4 μ.

Peaches at Wynberg (Cape Peninsula) were attacked in October, 1929, by *Phoma persicae* [ibid., iv, p. 618], causing the death of the twigs.

Phyllosticta ficicola and *P. psidii* occurred on the leaves of fig (*Ficus carica*) and guava (*Psidium guajava*), respectively.

Pleospora herbarum, with its conidial stage, *Macrosporium sarcinula* [ibid., x, p. 430] was found on dry stalks of onions killed by *Peronospora schleideni*, and on lucerne stems.

Honeydew melons were attacked by *Pseudoperonospora cubensis*.

The leaves of *Tetragonia expansa* were infected by *Puccinia tetragoniae* (uredospores and teleutospores).

Sphaerulina eucalypti n. sp. is characterized by amphigenous, subcuticular, globose perithecia, 154 to 210 μ in diameter and cylindrical to semi-clavate asci, 28·8 to 38·0 by 6·4 to 11·2 μ, containing eight ellipsoidal, 3- or rarely 4-septate, hyaline ascospores, tapering at both ends, 9·6 to 19·2 by 3·2 to 5·0 μ. It forms irregular, confluent, leaden grey spots with a narrow, raised margin on the leaves of *Eucalyptus* sp. in association with a *Phyllosticta*.

BAKER (C. F.). **Second supplement to the list of the lower fungi of the Philippine Islands. A bibliographic list chronologically arranged, and with localities and hosts.**—*Philipp. Journ. of Sci.*, xlvi, 3, pp. 479–536, 1931.

The present supplement (edited by F. L. Stevens) to the list of lower fungi of the Philippine Islands compiled by C. F. Baker and left by him in manuscript form about 1921, comprises Phycomycetes, rusts, smuts, Ascomycetes, and Fungi Imperfecti additional to those enumerated in Baker's two earlier lists. Literature references (many of which were added by the editor) and synonyms are given in a number of cases.

BURT (E. A.). **Hymenomycetous fungi of Siberia and Eastern Asia—mostly of wood-destroying species.**—*Ann. Missouri Bot. Gard.*, xviii, 3, pp. 469–487, 1931.

The present list of 127 Hymenomycetes—mostly wood-destroying species—from Siberia and Eastern Asia is stated to be based on the examination of some 250 carefully selected specimens. The compilation includes five new species, viz., *Trametes radiata* on *Betula dahurica*, *Hydnum murashkinskyi* on *B. verrucosa*, *H. reflexum* on *B.* sp., *Thelephora tenuis* on sandy ground, and *Coniophora sibirica* on decaying coniferous wood, probably *Pinus sylvestris*, and is thought to be of great interest in extending the westward range of certain species hitherto only known in the United States and the eastern range of many European species. Critical, taxonomic, and geographical notes are given.

Soriano (S.). **El 'corcovo' y el 'polvillo' del Tabaco en la República Argentina.** [The 'hunchback' and the 'fine dust' of Tobacco in the Argentine Republic.]—*Rev. Fac. Agron. y Vet.*, vii, 2, pp. 371–392, 4 pl., 1931.

The following symptoms have been observed by the writer to be typical of the 'hunchback' ('corcovo') disease of tobacco in the Argentine Republic [*R.A.M.*, i, p. 318; x, p. 562]. The terminal bud is bent over in the form of a crook, the concave region of which often shows necrotic streaks. Characteristic markings develop along the veins of the leaf blades, the interveinal areas of which dry out. Both external and internal necrotic streaks appear on the crook-shaped portion of the terminal bud. The general withering and yellowing of the plant is usually accompanied by decay of the roots, in which nematodes or other worms may be present; no decisive importance, however, is attached to these. The lower leaves of affected plants generally turn yellow and shrivel prematurely. During the season of 1928–9, the incidence of 'corcovo' in the Lerma Valley (province of Salta) was very low (1·3 per cent. in one plantation only), whereas the disease known as 'polvillo' or 'fine dust' (an unsuitable designation in the author's opinion) and mosaic were prevalent, the maximum percentage of the former being 60·4 and of the latter 71·6.

The leaves of plants suffering from 'polvillo' are curled and creased, the midrib showing well-marked necrosis and the lateral veins distinct necrotic lesions. The stems exhibit numerous necrotic streaks both externally and internally. The attack often occurs in the centre of the plant and proceeds in one direction only. There is no bending over of the terminal bud and seldom any rotting of the roots. The lower leaves generally remain healthy until the entire central region of the plant becomes involved when they also shrivel. The tip or upper half of the young leaves very frequently shows yellow spots that develop into necrotic areas, a feature which must be carefully differentiated from a somewhat similar manifestation of mosaic. Black necrotic streaks are almost always present on the exterior of the calyces.

In the writer's opinion, 'corcovo' and 'polvillo' are varying manifestations of a single disease which is provisionally referred to the virus group, comparisons being drawn between these disturbances and tomato streak, ring spot of tobacco, phloem necrosis and net necrosis of potato, mosaic of potato and tobacco, and bunchy top of banana.

The histological study of tobacco stems and leaves suffering from 'polvillo' and 'corcovo' revealed a complete absence of any parasitic organism. A constant feature of the diseased tissues was the presence of islets of dead cells with a dark granular content and devoid of nuclei and protoplasm, united in small groups. Another marked characteristic of the affected plants was the increased size of the intercellular spaces in the necrotic zones. Although the occurrence of cell inclusions (X-bodies) was not actually demonstrated, some of the microscopic preparations contained very regular, fusiform bodies, resembling minute protozoa, the nature of which is not yet clear.

Inoculation experiments in Salta, in which the expressed juice

of diseased plants was inserted through wounds into healthy ones, gave positive results in 23 cases out of 30, three others being doubtful. Some of the plants used as sources of inoculum had typical 'corcovo', other typical 'polvillo', while a few were intermediate. However, when these experiments were repeated at Buenos Aires, none of the inoculated plants contracted 'corcovo' or 'polvillo' symptoms, but one to two months later they developed severe mosaic. Supposing the disturbances under investigation to belong to the virus group, this phenomenon may be the result of a union of two distinct infective principles, of which mosaic would be one. Attempts to transmit the two diseases by means of insects gave negative results. In May, 1930, J. B. Marchionatto inoculated healthy Criollo Salteño, Hickory Pryor, and Hoja Parada tobacco plants with the expressed juice of 'corcovo' individuals, the outcome being positive in the two former varieties. The symptoms developed in 11 days on Criollo Salteño and in 14 on Hickory Pryor. Before unfolding, the leaves presented the typical symptoms of mosaic (green and yellow mottling with pronounced distortion), while at maturity they further showed irregular bulges in the leaf blade and zig-zag necrotic streaks partially delimiting the veins. The tip of the stem was slightly bent and finally growth was arrested; the tissues, especially of the phloem and xylem, became greyish; while the plants remained stunted and failed to flower.

In 1931, Hickory Pryor plants were inoculated with 'polvillo' juice and Criollo Salteño with that of 'corcovo'; in both cases the typical symptoms of mosaic developed on the 13th day after inoculation and persisted until the end of the test.

It would appear from these results that 'corcova' is an infectious disease, the exact relationship of which to 'polvillo' and mosaic requires further investigation along lines which are indicated at some length.

McLarty (H. R.) & Woolliams (G. E.). **Tomato breakdown.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 128–134, 1 fig., 3 graphs, 1931.

A progress report is given of investigations conducted during 1930 into tomato breakdown [*R.A.M.*, ix, p. 18] which in some seasons causes severe losses to growers in British Columbia, and is also representative of a type of disease found on many fruits there.

Three plots A, B, C, which received normal, excess, and deficient supplies of water, respectively (i.e., 11·76, 16·8, and 9·8 acre inches), were planted with tomato plants (Earliana variety) in which the terminal bud had been pinched off and two opposite lateral shoots allowed to develop into the two main stems to provide a treated portion and an untreated control portion on each plant. The treatment given consisted of a series of excessive temperature fluctuations (from an average of 120° F. to between 50° and 60°) over a three or five day period, obtained by placing glass cages over the plants, and the employment of artificial heat or the sun's rays.

The results obtained were as follows: in plot A, 7 out of 53 treated

fruits broke down against 1 in 50 in the untreated; in plot B, the figures were 2 out of 19 and 1 out of 15, respectively; and in plot C, 9 out of 20 and 3 out of 20. All the treated tomatoes showed a decrease in the firmness of the flesh, measured by a pressure tester, in comparison with the controls.

VALLEAU (W. D.) & JOHNSON (E. M.). **The viruses concerned in a natural epiphytotic of streak in Tomatoes.**—*Phytopath.*, xxi, 11, pp. 1087–1089, 1931.

Details are given of a natural epiphytotic of streak and mosaic occurring on tomato plants at the Kentucky Agricultural Experiment Station in October, 1930. The first symptoms of streak were observed when the plants were about 3 ft. in height, and a month later 22 out of 51 plants on the same bench were affected by streak and 12 by mosaic. The latter disease was also present in an adjoining greenhouse, where streak, however, was not found.

Inoculations were made on 59 Turkish tobacco plants from each of the 51 plants in the first house and from selected individuals in the second. Following infection, the tobacco plants could be placed in four groups, viz., healthy 15, infected with the healthy potato virus 3, with tobacco mosaic 18, and the same with necrosis 23 [*R.A.M.*, x, p. 409]. The healthy potato virus [ibid., xi, p. 132] was obtained from plants with a very distinct mottle, typical of the symptoms induced by the inoculation of tomatoes with this virus from potatoes. In tobacco the disease was characterized by small, concentric rings on rubbed leaves and necrotic ring and line patterns and watered silk chlorotic patterns in the newer leaves. It was found only in the first house. The tobacco mosaic virus was obtained from tomato plants with a rather severe mosaic, but no evidence of streak on the stalk or petioles and no leaf necrosis. The necrotic mosaic was derived from plants showing only the symptoms of the presence of tobacco mosaic or mosaic with some leaf necrosis, and from rapidly growing ones with stalk and petiole streak and leaf necrosis. On the rubbed leaves of tobacco plants inoculated with this virus necrotic spots developed in a few days and gradually increased until many of the leaves were killed. The symptoms of typical severe tobacco mosaic ultimately developed in the growing point, accompanied by necrotic dots or small rings, as well as by stunting. Mosaic, on transference to tomatoes, produced only mosaic.

It was shown in the following ways that streak in tomatoes and necrotic mosaic in tobacco are the result of a mixture of tobacco mosaic and the healthy potato virus. 1. A mixture of the two viruses produced symptoms in tobacco and tomato corresponding with those produced by the virus complex from streak tomatoes. 2. Symptoms of the healthy potato virus were clearly recognizable in tobacco plants affected with the streak virus complex. 3. Transfers of the streak virus complex to virus-free seedling potatoes produced stem and leaf streak typical of that produced by tobacco mosaic alone, but transfers to tobacco from potato leaves formed after inoculation resulted in only the concentric rings and

other symptoms characteristic of the healthy potato virus. 4. Transfers of the streak virus complex to *Datura stramonium* induced a mild mottling of the new leaves, and transfers from these to tobacco produced the disease caused by the healthy potato virus. The healthy potato virus was thus separated from the mixture and obtained pure in tobacco. The evidence seems to indicate that these two viruses only were concerned in the natural epiphytotic.

It is thought that the tobacco virus was spread from the first to the second house on the hands of workers, the potato virus apparently not being transmitted in this way.

Kartoffel-Ein- und Durchfuhrbestimmungen. Jugoslawien (Aenderung). [Potato import and transit regulations. Jugo-Slavia (amendment).]—*Oesterr. Zeitschr. für Kartoffelbau, 1931,* 4, pp. 88–89, 1931.

Apart from the usual regulations against wart disease [*Synchytrium endobioticum*: *R.A.M.*, ix, p. 816] in Jugo-Slavia, potatoes from Austria may not be imported on account of the sporadic distribution of the disease in that country, but their transit is permitted under stringent precautions.

Ministério da Agricultura. Campanha da produção agricola. [Ministry of Agriculture. Campaign of agricultural production.]—*Diário do Govêrno,* Sér. i, 268, pp. 2545–2546, 1931.

Decree No. 20:535 (6th November, 1931) requires that all consignments of potatoes imported into Portugal shall be accompanied by a duly authenticated certificate guaranteeing absence of wart disease (*Synchytrium endobioticum*) from their place of cultivation and a surrounding radius of 5 km. The importation of potatoes from America is prohibited. Inspectors are authorized to destroy (or return to the sender at the importer's expense) any potato consignments showing the slightest trace of wart disease or over 5 per cent. infection by *Phytophthora infestans*, *Spongospora subterranea*, *Actinomyces scabies*, *Fusarium* spp., and bacteria.

Gesetze und Verordnungen. [Laws and regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst,* xi, 11, pp. 95–96, 1931.

Saxon Free State. An Order of the Saxon Ministry of Economic Affairs, dated 14th February, 1931, establishes the lines on which the campaign against the elm disease [*Graphium ulmi*] should be conducted [*R.A.M.*, xi, p. 208], while a further Order of 7th October provides that uniformity with the methods employed for this purpose in Prussia shall be secured.

Colombia. A Decree of 1st July, 1931, requires that persons proposing to import plants or parts thereof into Colombia from foreign countries must obtain a special permit from the Ministry of Agriculture. All such consignments must be accompanied by an official certificate from the plant protection service of the exporting country guaranteeing freedom from injurious plant pests and diseases.

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JACZEWSKI (A. A.) & JACZEWSKI (P. A.). Определитель грибов. Совершенные грибы (диплоидные стадии.) Том I. Фикомицеты. [A key to fungi. Perfect fungi (Diploid stages). Vol. I. Phycomycetes.]—3rd, revised and augmented ed., 293 pp., 329 figs., Гос. Издат. С.-хоз. и Колхозно-Кооп. Литературы. [State Publishing Office of Agric. and Collective Farming Co-operative Literature], Leningrad, 1931.

In this, the first of a series of seven volumes covering the whole range of fungi so far known to science, the authors give diagnoses in Russian of species belonging to about 170 genera of the Phycomycetes, together with an exhaustive list of their substrata and hosts and, in regard to those that occur on the territory of the Union of Soviet Republics, notes of local interest. The Phycomycetes are divided into four main groups, namely, Uniciliatae, Biciliatae, Polyciliatae, and Aciliatae. The book is richly illustrated with figures, most of which are original, and is supplied with Latin indexes of the generic and specific names of the fungi, and of their hosts and substrata.

TUNSTALL (A. C.). **Heavy pruning and stem disease.**—*Quart. Journ. Indian Tea Assoc., 1931*, 3, pp. 145–158, 3 pl., 1931.

Some general observations are made on the connexion between excessive pruning and the progressive deterioration of tea plantations which occurs in areas in every tea district in Assam, associated with severe stem disease. Affected plants show the roots in good condition, but the stems are full of rotting holes. In early stages new growth arises from the collar, but eventually this becomes involved and a rotting stump is left with a few weak shoots. The disease in question is not due to any specific organism and is thought to arise from the physiological condition of the plants, though soil deficiency is evidently not involved as bushes newly planted in the affected areas grow normally. The problem is discussed in the light of recent information concerning the metabolism of the tea plant (pruned and unpruned) and the climatic conditions influencing the success of heavy pruning. Notes are also given on the method of ascertaining the amount of starch reserves in tea roots, the healing of wounds, wound paints, fungous infection of dead branches, preparation of bushes for heavy pruning, and other items of interest.

Dry rot in buildings: recognition, prevention, and cure.—*Dept. Sci. & Indus. Res., Forest Products Res. Leaflet* 6, 5 pp., 2 figs., 1931.

This is a condensed version of *Forest Products Res. Bull.* 1, entitled 'Dry-rot in wood', a notice of which has already appeared [*R.A.M.*, viii, p. 79]. In addition to *Merulius lacrymans*, the true dry rot fungus, *Coniophora cerebella*, *Poria vaporaria*, and *Paxillus panuoides* are mentioned as contributory causes of decay in timber in buildings.

MAGERSTEIN [V.]. **Rakovina Vrby.** [Crown gall of the Willow.]—*Ochrana Rostlin*, xi, 3–4, pp. 135–137, 2 figs., 1931.

Plantations of the American basket willow (*Salix americana*) over practically the whole of Czecho-Slovakia, but more particularly on heavy, acid, waterlogged soils, are stated to be heavily attacked by crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, viii, p. 347] which, besides stunting the twigs, renders them brittle and thus impairs their industrial utility. For the control of the disease the author recommends painting the willow stocks, while still in the dormant stage, with phenol preparations, e.g., a 5 to 7·5 per cent. solution of plantasan, arborol, or the like. It was noted that outbreaks of the crown gall are almost everywhere coincident with heavy infestation of the willow plantations by the weevil *Cryptorrhyncus lapathi*, the larvae of which feed on the galls and are an important pest of the trees.

WEISS (A.). **Ist der Pilz Graphium die Ursache des Ulmensterbens?** [Is the fungus *Graphium* the cause of the die-back of Elms?]—*Gartenwelt*, xxxv, 48, pp. 657–658, 1931.

The writer is inclined, as a result of extensive observations in Berlin, to attribute the widespread die-back of elms primarily to the sinking of the ground water level, e.g., near underground railways and canals, rather than to infection by *Graphium ulmi* [*R.A.M.*, xi, p. 14]. A contributory cause of the disease was the abnormally cold winter of 1928–9, while the activities of the sap beetle [*Scolytus scolytus*] must also be taken into consideration [see next page].

WOLLENWEBER (H. W.) & RICHTER (H.). **Infektionsversuche mit Graphium ulmi an Ulmen und anderen Laubbäumen.** [Inoculation experiments with *Graphium ulmi* on Elms and other deciduous trees.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 11, p. 89, 1931.

The occurrence of the elm disease due to *Graphium ulmi* was favoured in Germany by the heat wave in the summer of 1931. Not only were the symptoms more pronounced, but the percentages of infection resulting from inoculation experiments were uniformly higher than in the previous year. External symptoms of infection by *G. ulmi* were observed for the first time in *Ulmus vegeta* [*R.A.M.*, x, p. 213] and *U. alba* which had hitherto shown only a slight discoloration of the sapwood. The supposedly resistant Asiatic varieties, *U. pumila* and *U. pinnato-ramosa* [ibid., x, p. 695], also exhibited the latter symptom, so that a definite state-

ment on the reaction of these varieties to *G. ulmi* would as yet be premature.

Inoculation experiments on lime (*Tilia parvifolia*) with *G. ulmi* resulted in a typical wilting resembling that caused by *Verticillium albo-atrum* [cf. ibid., ix, p. 5]. In twelve other kinds of deciduous trees, viz., *Acer pseudoplatanus*, *A. platanoides*, *A. negundo*, alder, birch, *Sorbus* [*Pyrus*] *aucuparia*, oak, beech, poplar, ash, *Celtis australis*, and *C. occidentalis*, a more or less extensive penetration of the fungus was observed, but no external symptoms. Reisolation was effected in every case.

KAISER (P.). **Das Ulmensterben.** [The die-back of Elms.]—*Gartenflora*, lxxx, 11, p. 369, 1931.

According to recent statements in a well-known Berlin daily newspaper, all attempts to combat the die-back of elms [*Graphium ulmi*: see preceding abstract] by means of injections or fertilizers must be abandoned as hopeless, and at a meeting of the German Botanical Society the opinion was expressed that the valuable old elm stands throughout Central Europe are doomed to destruction. In the writer's opinion, the bark beetles, *Eccoptogaster* [*Scolytus*] *scolytus*, *E.* [*S.*] *multistriatus* and *E.* [*S.*] *laevis* are the primary agents of the injury [*R.A.M.*, xi, p. 138], *G. ulmi* occurring merely in a secondary capacity.

BAXTER (D. V.) & GILL (L. S.). **Deterioration of the Chestnut in the southern Appalachians.**—*U.S. Dept. of Agric. Tech. Bull.* 257, 21 pp., 4 pl., 4 figs., 1931.

The results of the investigation during four years [details of which are given] of the natural decay in chestnut trees (*Castanea dentata*) killed by blight (*Endothia parasitica*) in the southern Appalachians [*R.A.M.*, x, p. 276] showed that the sapwood of the trees is largely rotted by the fifth year after death, while the dead heartwood, both standing and felled, remains sound for many years. As a general rule timber from dead trees left standing for one year is practically as good as that from living trees for the manufacture of treated poles, and industrial wood may be obtained from chestnut trees for at least four years after their death.

In giving a brief account of the chief fungi found decaying chestnut slash in the forests, it is pointed out that some of these organisms, e.g., *Polystictus pergamenus* [ibid., ix, p. 432] and *Polyporus gilvus* [ibid., ix, p. 216] also actively destroy the sapwood of standing trees; *P. spraguei* [ibid., vi, p. 702], *P. sulphureus*, and, in some of the northern districts of the Appalachians, *Daedalea quercina* destroy the heartwood both of standing trees and felled logs. The fact that *P. pilotae* [ibid., ix, p. 216] was recovered in a viable condition from dead trees left standing for 12 years or more indicates that besides causing a heart rot of living chestnuts, this fungus may continue to decay the wood even after the death of the tree. Other common fungi on chestnut slash in the forests are *Polystictus hirsutus* [ibid., x, p. 217] and *Polyporus* [*Polystictus*] *cinnabarinus* [ibid., x, pp. 71, 635].

Boyce (J. S.). **The control of White Pine blister rust in the United States.**—*Quart. Journ. of Forestry*, xxv, 4, pp. 305–311, 1931.

In this paper the author briefly reviews the results so far obtained, and the work still to be done in the control of the white pine blister rust (*Cronartium ribicola*) in the United States [*R.A.M.*, xi, p. 143], with particular reference to the eradication of susceptible species of *Ribes*. Special attention is given to the spread of the disease in commercial stands of the western white pine (*Pinus monticola*) and sugar pine (*P. lambertiana*) in the forests of the north-western parts of the States.

Hurst (R. R.). **The nature, cause, and prevention of brown-heart in Turnips.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 176–181, 1 pl., 1931.

No evidence has been obtained that the condition known as brown heart of turnips in Prince Edward Island is of parasitic origin. It probably represents a physiological disturbance within the plant tissues brought about by physical or chemical agencies. There appears to be no reliable external indication of the presence of the trouble, but on cutting across the turnip a well-defined, brownish, mottled, more or less watery area, which never extends past the cambial layer, is visible. Sometimes there are concentric light and dark rings indicating growth periods. As the turnips grow older the brownish discoloration becomes less noticeable, and the mottling may vanish, leaving a greyish-brown, dry, punky mass of dried out and broken down cellular tissue. Turnips affected with brown heart do not rot, though brown heart is frequently confused with the rot due to *Phoma* [*lingam*].

Replies to a questionnaire sent to farmers showed that where manure was used in abundance brown heart was not present, but where no manure was applied 50 to 100 per cent. brown heart developed. It was less severe than usual when the manure was applied in the autumn before seeding time, or when heavy applications of compost were made shortly before seeding. Field experiments indicated that fertilizer and manure combined reduced brown heart development which was favoured, however, by the use of fertilizer alone.

Histological investigations showed that brown heart begins when the plant is in the seedling stage and originates in the lower section of the tap-root. The symptoms appear to be associated with an abnormal development of the xylem vessels.

MacLeod (D. J.). **Resistance of varieties of Turnips to club-root.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 181–182, 1931.

During 1930, 112 commercial varieties and strains of swedes and turnips were tested in New Brunswick for resistance to finger-and-toe (*Plasmodiophora brassicae*). Sixty-nine showed no resistance, 41 varieties showed 20 to 75 per cent. severe infection, and two varieties, White and Aberdeen, developed slight disease in the rootlets. Fifty-nine selections from different commercial

varieties and 41 crosses made in 1929 at the Dominion Experimental Station were also tested. Fifty-three of these selections showed no resistance, and six varieties showed from 30 to 90 per cent. freedom from finger-and-toe. Twenty-five of the crosses showed no resistance, and sixteen of them showed 25 to 100 per cent. freedom from the disease. Selections from the White swede annually tested and re-selected since 1926 were found to be stabilized with a high degree of resistance. A combination of this variety with Bangholm Studsgaard is practically immune from the disease and possesses most of the desirable qualities of the Bangholm Studsgaard.

MacLeod (D. J.). **Determination of the occurrence of biologic forms of Plasmodiophora brassicae.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 25–26, 1931.

Experimental evidence was obtained suggesting the existence of biologic forms of *Plasmodiophora brassicae*, but tests of material from 50 different sources failed to confirm this evidence [cf. *R.A.M.*, xi, p. 16]. It was, however, demonstrated that there are partially resistant lines within certain families of crucifers.

Vestal (E. F.) & Bell (F. G.). **A preliminary study of some environmental factors on the spread of Cercospora leaf spot and yield in checked and drilled Sugar Beets.**—*Amer. Journ. of Botany*, xviii, 9, pp. 705–716, 1 diag., 4 graphs, 1931.

This is an expanded account of the investigations on the comparative value of checking and drilling in the control of leaf spot of sugar beets (*Cercospora beticola*) conducted in Iowa during 1929–30 by the first-named author and I. E. Melhus, an abstract of which has already been noticed [*R.A.M.*, x, p. 427].

Peuser (H.). **Fortgesetzte Untersuchungen über das Vorkommen biologischer Rassen von Colletotrichum lindemuth. (Sacc. et Magn.) Bri. et Cav.** [Continued investigations on the occurrence of biologic strains in *Colletotrichum lindemuth.* (Sacc. et Magn.) Bri. et Cav.]—*Phytopath. Zeitschr.*, iv, 1, pp. 83–112, 6 figs., 1 diag., 1 graph, 1 map, 1931.

Experiments were carried out at Bonn-Poppelsdorf in continuation of those described by Budde [*R.A.M.*, viii, p. 349] with 70 isolations of *Colletotrichum lindemuthianum* from beans from all parts of Germany.

The results [which are fully discussed and tabulated] indicated that the majority of the isolations fall into the collective group previously designated as X. To the known biologic forms A, B, C, D, and E may now be added seven new ones, viz., G, H, I, K, L, M, and N. Form G, from Stöckte, Hanover, is, like A, highly virulent to all the varieties tested. Form H, from Kirchwärden, Hamburg, also proved highly virulent to all varieties except Braune Brech (Terra). Form I (Brunswick) attacked five ordinarily resistant varieties, while form K (Irrhove, near Emden)

was similar except in its inability to infect the normally susceptible Weisse Hinrich Riesen (stringless). Form L, from Dresden, from which form N (Bonn) differed only in cultural characters, caused severe infection on four Wachs varieties, but failed to attack 11 others. Form M (Berlin-Malchow) proved virulent towards Wachs Schlachtschwert, Früheste Nordstern, and Princess (double stringless) whereas the ordinarily susceptible Braune Brech, Bunte Hinrichs Riesen, and Weisse, Hinrichs Riesen (stringless) remained practically immune.

In biomalt agar cultures forms I, G, H, X, M, and N produce a luxuriant, blackish-green mycelium with incipient sporodochia and pseudopycnidia. Forms L and K, on the other hand, produce a more slender mycelium, often remaining hyaline for a long time and turning brownish-green only at the sites of development of the sporodochia and pseudopycnidia, which are formed much more freely than by the preceding strains. Forms X, M, and N grow much more rapidly than the others at the optimum temperature for the fungus of 20° C., whereas at 29° the relative positions are reversed. The conidia of the less virulent strains X, M, N, and L were larger on an average (14·16, 16, 15·2, and 15·6 μ, respectively) than those of the more highly pathogenic G, H, I, and K (12·9, 13·4, 13·6, and 13·02 μ, respectively).

Bean plants from which light was excluded were more severely and rapidly attacked than those normally illuminated. In inoculations at 12° the incubation period was prolonged, but a large amount of infection was sometimes secured, whereas at 28° to 29° normal infection did not take place. Inoculation experiments on 95 commercial bean varieties with a mixture of all the abovementioned forms indicated that none is sufficiently resistant to serve as a basis for breeding trials.

WOOLLIAMS (G. E.). **Cause and control of field rot of Onions.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 139–145, 1931.

In the spring of 1929, soil severely infected with the organism causing *Fusarium* bulb rot of onions was submitted to treatments with numerous [named] chemicals none of which gave any control of the disease. Some years ago the rot was present only to a slight extent in the principal onion-growing locality in British Columbia, but as the Yellow Globe Danvers variety, which is that principally grown there, has proved to be quite susceptible, the disease has spread extensively, and now causes losses ranging up to 15 per cent.

Tests of the susceptibility of 86 [named] onion varieties [the results of which are tabulated] were conducted, and it was found that nine varieties showed no or under 1 per cent. infection, and twenty-three varieties showed 1 to 4 per cent. infection. Of all the varieties tested, Yellow, White, and Red Bermuda onions appeared to be the only ones which consistently showed resistance. Leeks (*Allium porrum*) and chives (*A. schoenoprasum*) were apparently immune; White or English Welsh onion (*A. fistulosum*) remained unaffected, but Red or French Welsh onion showed about 7·5 per cent. infection.

RICHARDSON (J. K.). **Celery heart rot.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 134–137, 1 fig., 1 graph, 1931.

The first abnormal condition observed in celery affected by heart rot or black rot [*R.A.M.*, iv, p. 592; viii, p. 758] in Ontario is the formation of necrotic areas at the tips and margins of the young heart leaflets. As the disease progresses, this necrosis increases until the entire leaves are affected, the disintegration then descending through the stalks and rotting the heart; only the outer leaves remain unaffected.

Most of the isolations from diseased tissues revealed the presence of a soft-rotting bacterium but some gave pure cultures of an unidentified fungus. Tests with these, however, and also in growing celery in soil perpetually moist and in soil alternately moist and dry gave negative results.

MALLAMAIRE (A.). **L'extension de la maladie des taches brunes de l'Arachide en Afrique Occidentale Française et au Cameroun.** [The spread of the brown spot disease of Groundnuts in French West Africa and the Cameroons.]—*Agron. Colon.*, xx, 164, pp. 37–39, 1931.

In French West Africa groundnuts have in recent years become much more widely attacked by *Cercospora personata* [*R.A.M.*, vii, p. 305] than was formerly the case. In 1913, the disease was recorded from the French Congo but was said not to occur in Senegal, where, however, it was found in 1924, and was reported to be recurring annually in 1927. In the Cameroons the disease is about as prevalent as in Senegal, and in both districts it may cause losses up to 15 or 20 per cent. of the crop. For purposes of control the author suggests the burning of diseased husks, disinfection of the seed, and especially the development of resistant varieties.

CLAYTON (E. E.). **Vegetable seed treatment with special reference to the use of hot water and organic mercurials.**—*New York (Geneva) Agric. Exper. Stat. Tech. Bull.* 183, 43 pp., 6 figs., 1931.

This bulletin summarizes the results [some of which have already been noticed from another source: *R.A.M.*, x, p. 396] obtained in the investigation, during nine years, of the effects of various methods of seed disinfection, more particularly by the hot water method and by organic mercury preparations, on the viability of the seed of vegetable crops, and on the density of the stands raised from the treated seed. It was conclusively shown that the stimulation of growth which has been claimed to result from some of the mercury and copper compounds is not a constant effect even under greenhouse conditions and is of no practical value in the field. Liquid mercury compounds had a very detrimental effect on the viability of certain seeds (especially Lima beans [*Phaseolus lunatus*]), although in some greenhouse experiments they gave marked control of damping-off. Organic mercury dusts, on the other hand, did not affect injuriously the germination, immediate or delayed, of the seeds tested, and may therefore be safely used

at any time in advance of sowing. The organic mercury preparations were of special value in protecting the germinating seed from decay in the soil, while copper compounds came next in value in this respect. Injury from the hot water treatment was greatest with seeds of low vitality, and was proportionate to the severity of treatment. For safety this treatment should only be used on seed of good viability and not too far ahead of sowing. The addition of aluminium sulphate or zinc sulphate to the hot water in some cases prevented part of the delayed injury from the treatment.

[A more popular version of this paper is published as *Bulletin* 597.]

STRAŇÁK (F.), BLATTNÝ (C.), & KLEČKA (A.). **Mosaika Revy vinne.** (**Předběžné sdělení**). [Mosaic of the Vine. (Preliminary report).]—*Ochrana Rostlin*, xi, 3–4, pp. 89–98, 1931. [French summary.]

In giving a fuller morphological and histological description of the vine mosaic previously briefly described by Smolák from Mělnik, Czecho-Slovakia [*R.A.M.*, xi, p. 157], the authors state that the disease is of over forty years' standing in that locality, but has not yet been authoritatively reported from any other part of the country. Investigations during the last five years have shown that the disease only attacks varieties of the European vine (*Vitis vinifera*), none of which has so far been found to be immune from it; in some varieties, however, it is present in a latent form, and is only revealed when a more susceptible variety is grafted on the carrier, in which case the symptoms sometimes are aggravated, suggesting an intensification of the virulence of the active agent by passage through the tolerant host. Attempts to transmit it to plants outside the genus *Vitis* have so far failed, but it appears to have some affinities with certain other mosaics, especially that of the raspberry.

Experiments have indicated that this mosaic is readily transmissible by grafting, by injections of diseased juice into healthy stocks, through wounds in the aerial or underground organs, especially by pruning tools during the vegetative period, and by certain sucking insects, e.g., *Lecanium corni* and aphids. It is not, however, present in, or transmissible through, the soil.

The spread of the disease in the vineyards of Mělnik is stated to have been practically checked (eight new infections in 1931, as against 600 in 1929) by strict control measures, such as the immediate removal of all vine stocks showing the first signs of infection, suppression of sucking pests, and careful disinfection of pruning tools when passing from one plant to the next.

It is pointed out that the Mělnik mosaic presents some features in common with other virus diseases of the vine, more particularly 'roncet' [ibid., x, p. 158; xi, p. 28] from which it differs, however, by very distinct symptoms, though in one case, in which it was transmitted to an American vine stock, there was a certain similarity. Definite cases of 'roncet' have recently been established in Czecho-Slovakia, and all attempts to break up the virus causing this disease into two or more entities, one of which would produce the Mělnik form, have given negative results. The inference,

therefore, is that the Mělnik mosaic is due to a special virus, the true nature of which has still to be investigated.

POLLACCI (G.). **Rassegna sull'attività del Laboratorio Crittogamico di Pavia (Osservatorio Fitopatologico per le provincie di Cremona, Parma, Pavia e Piacenza) durante l'anno 1930.** [Report on the activity of the Cryptogamic Laboratory of Pavia (Phytopathological Observatory for the provinces of Cremona, Parma, Pavia, and Piacenza) during the year 1930.] —*Atti Ist. Bot. R. Univ. di Pavia,* Ser. IV, ii, pp. 271–285, 1931.

After a general account of the work of the Cryptogamic Laboratory, Pavia, during 1930, a list is given, arranged under hosts and including numerous human and animal pathogens, of the diseases identified in the course of the year, among which may be cited *Bacillus baccarinii* on vine branches, *Sporotrichum persicae* on peach fruits, *Cytospora rubescens* on peach stocks, and *Fusarium lateritium* [*Gibberella moricola*: see below, p. 306] on mulberry branches. Necrosis of pear branches observed in Mantua, Rimini, and Como is attributed to *B. amylovorus,* but no mention is made of the isolation of the organism [*R.A.M.*, v, p. 208].

Trabajos de las estaciones de fitopatologia agricola en el año 1930. [Work of the Stations of Agricultural Phytopathology in the year 1930.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 137–166, 1931.

Lists are given of the principal plant diseases investigated at the Spanish Phytopathological Stations during 1930 [cf. *R.A.M.*, x, p. 160]. Among other items of interest the following may be mentioned. *Fusarium oxysporum* f. 3 [which Wollenweber regards as the correct name for *F. cubense*: ibid., x, p. 626] was isolated from diseased bananas in the Orotava Valley, Teneriffe, this being the first definite record of the rot in the vicinity of Europe [but see ibid., v, p. 374]. A species of *Cephalosporium* was also isolated from the infected fruit.

The study of the so-called 'whitewash' disease of chillies [*Capsicum annuum*] in Valencia and Catalonia was continued. The plants were found to be attacked by *Oidiopsis sicula* [ibid., viii, p. 756], probably the conidial stage of *Leveillula taurica,* while *Cercospora capsici* Unamuno [cf. ibid., ix, pp. 135, 613; x, p. 777] was also observed, the latter being of interest as the first record [in Spain] of the genus *Cercospora* on chillis.

PRISSYAJNYUK (A. A.). Материалы по изучению грибных заболеваний полевых культур Нижне-Волжского края. [Contributions to the study of fungous diseases of field crops in the Lower Volga region.]—*Plant Protection,* Leningrad, vii, 4–6, pp. 323–337, 1931.

In this paper the author gives a preliminary report of his observations during the 1929–30 season on the relative resistance of cereal varieties to fungous diseases in the experimental fields of the Saratoff Seed Selection Station in the Lower Volga basin. Loose smut (*Ustilago tritici*) only occurred on spring-sown wheats,

among which all belonging to the *durum* group were highly resistant or immune. Of the soft (*vulgare*) wheats the highest resistance was exhibited by the *erythrospermum*, *milturum*, and *caesium* varieties. The resistance of these varieties is correlated with the fact that their flowers remain closed during the whole flowering period, or open late, after the grain has set, this allowing the latter to escape infection by the smut spores. All the spring-sown *durum* wheats were also very resistant to brown rust (*Puccinia triticina*), but good resistance was also shown by most of the *vulgare* wheats. There were clear indications that in this region winter wheats suffer less from the disease than the spring-sown and that among the latter the earlier sowings show less infection than the later ones. Among the diseases of rye the most prevalent was leaf blotch (*Marssonia secalis*) [*Rhynchosporium secalis*: *R.A.M.*, x, p. 625] on spring-sown crops, and ergot (*Claviceps purpurea*) was also abundant locally. In one nursery a rot of oat panicles before emergence from the sheaths was caused by an undetermined species of *Fusarium*; the disease was especially severe during very hot weather.

Among other crops sunflower (*Helianthus annuus*) suffered from a dry rot of the maturing seeds in the inflorescence, caused by *Rhizopus nigricans*, and from a bacterial leaf spot causing a premature wilting of the foliage. A serious seedling blight of lentils was caused by an unnamed species of *Fusarium*.

UPPAL (B. N.). **Appendix L. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1930–31.**—*Ann. Rept. Dept. of Agric. Bombay Presidency for the year 1930–31*, pp. 209–213, 1931.

The fungus causing powdery mildew of *Cuminum cyminum* in the Bombay Presidency is thought to be probably an undescribed species of *Oidium* [cf. *R.A.M.*, x, p. 362]. It is characterized by a branched, hyaline, septate mycelium, 4 to 6·5 μ in diameter, forming a dense, greyish-white coating on all the green parts, especially the seed; septate, erect, moderately thick, single, hyaline conidiophores, 106·5 to 166·5 μ in length; and hyaline, rounded cylindrical, catenulate conidia, falling off at maturity and measuring 35 to 40·9 by 13 to 16·9 μ. Very good control of the disease was obtained over an area of 2·75 acres by dusting with sulphur, the first application being given just before flowering and the second at the time of seed formation. The total cost of the treatment is Rs. 5 [7*s*. 6*d*.] per acre. The pathogenicity of a species of *Macrosporium* isolated from *C. cyminum* has been demonstrated.

Further experiments in the control of fig rust [*Kuehneola fici*: ibid., x, p. 585] by sulphur dusting indicated that the best results are given by four to five applications at four- or five-week intervals, the first being made not later than 15 days after the first watering and the last not later than the end of February, though if necessary a light application may be given in March. The amount of 200-mesh sulphur dust required to treat an acre (200 trees) ranges from 50 to 65 lb.

A species of *Fusarium* has been shown to cause a wilt of sunn hemp [*Crotalaria juncea*: ibid., xi, p. 107], some varieties of

which gave evidence of resistance to the fungus in pot and field trials.

The best control of betel vine [*Piper betle*] wilt (chiefly caused by *Phytophthora* sp. during the monsoon while *Sclerotium rolfsii* does some damage in the dry season) was given by Bordeaux mixture, applied at the rate of 1 gall. per 12 ft. row before the vines were lowered and at 2 galls. after this operation [ibid., xi, p. 158].

Evidence has been obtained that *Sclerospora maydis* is synonymous with *S. philippinensis* [ibid., vii, p. 303; ix, p. 319].

BRITON-JONES (H. R.). **Trinidad plant diseases. Notes on some diseases of main crops in Trinidad.**—*Trop. Agriculture*, viii, 11, pp. 300–302, 1931.

In this paper notes are given on some of the more important diseases of economic crops in Trinidad, including black pod and canker of cacao caused by *Phytophthora palmivora* [*R.A.M.*, ix, p. 20] (stated to be the cause of the heaviest losses to this crop in the island); bronze leaf wilt of coco-nut palms [ibid., ix, p. 238]; mosaic and root diseases of sugar-cane; and brown eye spot (*Cercospora coffeicola*) [ibid., x, p. 659], viruela or American leaf disease (*Omphalia flavida*) [ibid., ix, p. 437], and *Sclerotium coffeicolum* [ibid., ix, p. 650] on coffee. Wither-tip (*Gloeosporium limetticolum*) [ibid., x, p. 160] of lime is so general in Trinidad as to have inflicted a serious check on the cultivation of this tree. Young plants of sour orange [*C. aurantium* var. *bigaradia*] in nurseries are severely attacked by scab (*Cladosporium* [*Sporotrichum*] *citri*) [ibid., x, p. 654] in several parts of the Island; they are not killed, but their growth is markedly retarded by the disease.

Reports of the Agricultural Department, Dominica, 1929–30 and 1930–31.—*Trinidad, Imper. Comm. of Agric. West Indies*, 51 pp., 1 fig., 1931.

So great was the damage caused to limes in Dominica in 1928 by a hurricane even worse that that experienced two years previously, that red root disease (*Sphaerostilbe repens*) [*R.A.M.*, ix, p. 20] spread exceedingly rapidly, and it soon became evident in the Island that the seedling lime was doomed. During 1929–31, the disease has continued to cause serious loss, and exports of lime products are expected to fall further until recent plantings of the lime grafted or budded on stock resistant to disease and to uprooting by hurricanes come into bearing. In the Department's nurseries, seedling limes grown for grafting succumbed at a very early age to root diseases, before they had become affected by hurricanes or grub attacks, and in one locality where seedling limes and sour oranges [*Citrus aurantium* var. *bigaradia*] were planted on infected land all the lime seedlings died, although the sour oranges appeared to thrive.

One instance of witches' broom of lime (probably caused by *Sphaeropsis tumefaciens*) [ibid., ix, p. 63] was observed, characterized by hard, woody enlargements of the nodes and hypertrophy of the buds.

Citrus scab [*Sporotrichum citri*] caused considerable trouble in sour orange nurseries in 1929–30, and in February, 1931, assumed alarming proportions in one nursery. Repeated spraying with Bordeaux mixture 5–5–50 was necessary to keep the disease under control.

Of the many citrus varieties resistant to wither-tip [*Gloeosporium limetticolum*: ibid., viii, p. 776] which have been introduced by the Agricultural Department, Bears' seedless, Tahiti, and the Woglum lime most closely approximate to the characteristics of the West Indian lime, so far as the fruits are concerned. The Woglum lime has proved to be a heavy bearer on the sour orange stock and is the most sought-for variety in wet districts. The fruits are larger than those of the West Indian, but the acid content is high and the juice flavour very similar to that of the West Indian lime. About 50 per cent. of the hybrids raised by crossing *Citrus aurantifolia* and the Woglum lime with the West Indian lime appear to be quite useless, but tests made with a few promising Aurantifolia crosses indicated that the acidity was well up to standard.

Department of Botany and Plant Pathology.—*Ann. Rept. Virginia Agric. Exper. Stat. for the period July 1, 1927, to June 30, 1931*, pp. 28–34, 1931.

This report on phytopathological work conducted by F. D. Fromme and S. A. Wingard, with the assistance of G. M. Shear, R. G. Henderson, A. B. Groves, and R. H. Hurt, contains the following among other items of interest. Studies on black root rot of apple [*Xylaria mali*: *R.A.M.*, vii, p. 645] have been in progress for the last 14 years, during which time no stock showing immunity from the disease has been observed, though varying degrees of resistance were noted. Some promise of control has been given by soil sterilization with steam.

In connexion with an investigation on bean [*Phaseolus vulgaris*] rust [*Uromyces appendiculatus*: ibid., x, p. 810] which has been in progress since 1917, crosses have been made between the Navy and Improved Goddard, and the Kentucky Wonder and Marblehead Pole varieties, with encouraging results. Rust resistance was found to be a dominant factor in beans, all the F_1 plants possessing this character. In the second generation segregation of the characters for resistance and susceptibility occurred more or less in accordance with Mendel's law.

Infection by tobacco ring spot has been secured on 37 different genera of plants distributed among 17 families [ibid., xi, p. 132]. In 1929 95 per cent. of the tobacco acreage in Washington County showed ring spot, up to 90 per cent. of infection occurring in certain fields, while the average amount was estimated at 8 per cent., which would probably cause about 1 per cent. decline in yield. About 64,500 tobacco seedlings grown from diseased seed were observed, and not one developed any symptoms of ring spot.

Twenty-ninth Annual Report of the Bureau of Science, Philippine Islands, for the year ending December 31, 1930.—pp. 801–889, 1931.

Among the items of phytopathological interest in this report

the following may be mentioned. *Cinchona* suffered from a disease involving the girdling of the branches or even of the main trunk by cankers, the cause of which is still obscure.

The tomato disease known in the United States as southern blight (*Sclerotium rolfsii*) was found causing damage in eight districts including Laguna and Batangas [*R.A.M.*, vi, p. 584].

Studies were conducted on the virus diseases of pechay [*Brassica pekinensis*], Chinese radish, mustard, turnip, watermelon, and sincama [*Pachyrrhizus angulatus*].

LAYCOCK (T.). **Experiments on the fermentation and moulding of Cacao.**—*Ninth Ann. Bull. Agric. Dept. Nigeria, 1st August, 1930*, pp. 5–26 [? 1930. Received February, 1932.]

The results [which are discussed and tabulated] of experiments on cacao fermentation conducted in Nigeria during the seasons 1928–9 and 1929–30 [cf. *R.A.M.*, viii, p. 296] indicated that the exclusion of purple beans from the prepared product can only be effected by the use of very mature beans or by unduly protracted fermentation. However, since over-ripe beans are usually germinated, while over-fermented ones are dark, very brittle, and may be affected by internal moulding due to *Aspergillus glaucus*, *A. fumigatus*, *A. tamarii*, and *A. sydowi* [ibid., ix, pp. 162–164, 309], it appears that no rational method of fermentation will prevent the occurrence of some purple beans in ordinary cacao. On the other hand, freedom from insufficiently fermented beans can be obtained by practically any of the ordinary methods of fermentation [details of which are given]. Collapsed beans, which are of frequent occurrence in cacao samples, are stated to be due to very rapid drying of well-fermented cacao during the first day.

Exportable dry cacao from the Ibadan district, when passed by the Produce Examiners, generally has such a low moisture content (not exceeding 8 per cent.) that the risk of subsequent moulding is almost negligible. It was shown by experiments that the fungi responsible for internal moulding enter the bean through the micropyle. In one case beans having the micropylar end covered with a toxic cement, consisting of necol (a celluloid varnish) mixed with finely powdered copper sulphate and mercuric chloride, showed only 10 per cent. internal moulding as compared with 76 per cent. in a corresponding lot with the micropylar end exposed to infection. In a sample entirely covered with the cement there was complete freedom from moulding. In another test, beans were partially embedded in paraffin wax, one lot with the micropyle covered and another with it exposed. The beans were then sprayed with a spore suspension of *A. flavus* and the percentages of internal moulding which subsequently developed were 39 and 88, respectively.

PRISSYAJNYUK (A. A.). Новая бактериальная болезнь Пшеницы, ‚блэк-чаф‘ в Нижне-Волжском крае. ['Black chaff', a new bacterial disease of Wheat in the Lower Volga region.]—*Plant Protection*, Leningrad, viii, 3, pp. 305–307, 1 fig., 1931.

The author states that although black chaff of wheat was recorded for the first time in the Lower Volga basin in 1929, there is

evidence that the disease is of much longer standing in that area. Isolations from diseased material showed that the disease is caused by *Bacterium translucens* var. *undulosum* [*R.A.M.*, xi, p. 163], a very brief account of which is given, based on American investigations. The disease in the Lower Volga region only attacks winter wheats, in susceptible varieties of which the incidence varied from 15 to nearly 62 per cent., while others appeared to be highly resistant or immune. Besides disinfection of the seed-grain with 0·01 per cent. mercuric chloride, the best means for the control of black chaff is considered to be the use of grain originating from disease-free crops, as infection was proved to be seed-borne, and also avoiding the application to cereal fields of manure from cattle fed on black chaff straw; such cattle should not be allowed to graze or even work on land destined for cereal crops.

Shitikova-Roussakova (Mme A. A.). Влияние воздушных течений на появление и развитие ржавчинных эпидемий в различных районах Союза. [The effect of air currents on the appearance and development of rust epidemics in various regions of U.S.S.R.]—*Plant Protection*, Leningrad, vii, 4–6, pp. 361–363, 1931.

In this note the author briefly summarizes the information on the appearance and spread of cereal rust epidemics [*Puccinia* spp.] in various parts of European and Asiatic Russia obtained through the investigation of the fungal flora of the air by means of aeroscopes [*R.A.M.*, viii, p. 763; ix, pp. 440–442, *et passim*]. She points out the practical importance of this study in field tests of cereal varieties for resistance to rusts, since the absence of spores of a given rust form in the air at the time when the crops are susceptible to it, which can only be established by a careful examination of the atmosphere, may lead to the erroneous conclusion that the varieties tested are resistant to that form. Periodical examinations of the air may also be used to determine the most propitious time to carry out the dusting of the cereals with sulphur by aeroplanes for the control of the rusts.

Greaney (F. J.). **Sulphur dusting for the prevention of cereal rusts.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 61–66, 2 figs., 1931.

During 1930, further field trials were conducted in Manitoba for the control of stem and leaf rusts of wheat [*Puccinia graminis* and *P. triticina*] by sulphur dusting [cf. *R.A.M.*, x, p. 587; ix, p. 196], thirty acres of Marquis wheat on one farm being given 30 lb. of kolodust per acre at five-day intervals from 16th July until 1st August by means of a horse-drawn Niagara 'Aero' duster, and ten acres on another farm receiving identical applications from a Niagara self-propelled power duster. On the first farm the dusting increased the yield by 16 bushels per acre and raised the grade from no. 3 to no. 1 Northern, while on the second farm the yield was increased by 6·2 bushels per acre and the grade raised from no. 2 to no. 1 Northern. The cost of the treatment (about $5 per acre) was sufficiently low to yield a very good margin of profit.

The results of co-operative field experiments conducted during 1930 to devise a satisfactory wheat dusting schedule are tabulated. In three localities the best rust control was given by nine to eleven applications of kolodust made twice weekly at the rate of 20 lb. per acre. On two farms this treatment increased the yield by 18 bushels per acre. Six weekly dustings of 40 lb. per acre increased the yield by 15·5 bushels per acre.

Aeroplane sulphur dusting [cf. ibid., vii, pp. 368, 566] with the specially designed Keystone Puffer machine was applied to 428 acres of Marquis wheat, part of each field (totalling 286 acres) being left untreated. The [tabulated] results show that stem rust was markedly reduced, the percentage infection in one field, for example, falling from 55 to 10 per cent. with an increased yield of 10·1 bushels per acre after five applications of 20 lb. per acre. The quality of the grain remained, however, unaffected. Leaf rust was not satisfactorily controlled, and in most of the fields the gain represented by the improved yield and grade did not cover the cost of aeroplane dusting.

JOHNSON (T.). **Studies in cereal diseases. VI. A study of the effect of environmental factors on the variability of physiologic forms of Puccinia graminis tritici Erikss. and Henn.** —*Canada Dept. of Agric. Bull.* 140, N.S., 76 pp., 10 figs., 7 graphs, 1931.

A detailed account and discussion is given of experiments at the Dominion Rust Research Laboratory, Winnipeg, to determine the effect of environmental factors (only two of which, namely, temperature and carbon dioxide concentration in the atmosphere, were studied under controlled conditions) on the development of certain physiological forms of *Puccinia graminis tritici* on Stakman's and Levine's twelve differential varieties of wheat [*R.A.M.*, ii, p. 158]. The physiological forms tested included forms 11, 17a, 29, 32, 38, 48, 76, 82, 85, 87, 89, 90, 91, and 92, which had previously been found to produce an X-reaction [ibid., xi, p. 33] on certain of the differential hosts. It was shown that at a temperature of about 60° F. and at a low to moderate light intensity, these varieties are immune from the rust, while at about 75° and the same light intensity they are completely susceptible [cf. ibid., xi, p. 231]. The reaction of the hosts was also gradually shifted towards susceptibility by increased intensity of light, temperature, and other conditions remaining constant. It is pointed out, however, that this effect is confined to the reaction of certain of the wheat varieties to some of the physiological forms, since the same varieties when infected by other forms do not show this response. As measured by its effect on the production of the X-reaction, carbon dioxide at concentrations varying from 0·03 to 4·5 per cent. did not exert any stimulating effect on the development of the rust; the higher concentrations appeared to affect adversely, but not to inhibit this development. Experiments to test the effect of mineral starvation of wheat seedlings on the development of the rust, with particular reference to the production of the X-reaction, showed that this factor did not seem to influence the type of infection, although infections

were less numerous on seedlings grown in solutions deficient in some of the mineral salts [cf. ibid., xi, p. 98].

A separate section of this paper deals with the effect of temperature on the formation of the teleuto stage of *P. graminis tritici* and on the germination of the teleutospores produced in the greenhouse; the results of this work have already been noticed from another source [ibid., xi, p. 230].

GASSNER (G.). **Das Standardsortiment zum Nachweis der physiologischen Spezialisierung des Weizenbraunrostes, Puccinia triticina Erikss.** [The standard varieties used for the recognition of physiologic specialization in the brown rust of Wheat, *Puccinia triticina* Erikss.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 4, pp. 403–406, 1931.

Scheibe's substitution of the American wheat variety Michigan Amber for Turkey 47 as a differential for the recognition of physiologic specialization in brown rust (*Puccinia triticina*) [*R.A.M.*, ix, p. 767] is stated in a letter from Prof. Johnston to be based on a misunderstanding. The Michigan Amber 29–1–1–1 seed was sent to Scheibe by Mains as a susceptible variety upon which to grow stock cultures of the rust, but Scheibe assumed that it was identical with Turkey 47, the reactions of which to the first 12 physiologic forms of *P. triticina* (except XI) were accordingly assigned to Michigan Amber. However, since the reactions of the latter variety to the first 12 physiologic forms are unknown, and since it has been shown by Scheibe to be susceptible to all his collections of leaf rust, its use for differential purposes does not seem advisable. In the same communication Prof. Johnston states that the hitherto unnamed varieties C.I. 3756, 3778, 3779, and 3747 are to be known as Carina, Brevit, Loros, and Similis, respectively. The last-named has been found to be identical with Webster C.I. 3780, while Norka C.I. 4377 is the same as Malakoff C.I. 4898, so that Similis C.I. 3747 and Norka C.I. 4377 will be discarded from the list of differential varieties, which now runs as follows: Malakoff C.I. 4898, Carina C.I. 3756, Brevit C.I. 3778, Webster C.I. 3780, Loros C.I. 3779, Mediterranean C.I. 3332, Hussar C.I. 4843, and Democrat C.I. 3384.

TSCHOLAKOW (J. W.). **Ein Beitrag zur physiologischen Spezialisierung des Weizenbraunrostes, Puccinia triticina Erikss.** [A contribution to the physiologic specialization of brown rust of Wheat, *Puccinia triticina* Erikss.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 4, pp. 407–411, 1931.

Six biotypes of brown rust of wheat (*Puccinia triticina*) were isolated, by using the revised standard wheats [see preceding abstract] from 13 collections (4 from Germany, 1 each from Holland and Austria, 4 from Hungary, and 3 from Bulgaria [*R.A.M.*, xi, p. 33]. Of these, forms XI, XIII, XIV, XVII, and XX were already known, while one (XXV from Budapest) is new.

Generally speaking, the writer's observations as to the distribution of the different physiologic forms of *P. triticina* confirm those of Scheibe, but a few discrepancies have arisen. Thus, forms XI and XIV, referred by Scheibe to western Europe, were found by

the writer to predominate in the east. Forms XIII, XVII, and XX appear, both from the present investigations and those of Scheibe, to be confined to eastern Europe, but it seems doubtful whether a rigid line can be drawn between the eastern and western groups of biotypes.

VANTERPOOL (T. C.). **Cultural and inoculation methods with Tilletia species.**—*Science*, N.S., lxxv, 1931, pp. 22–23, 1932.

Since 1925 the writer has used the double or inverted plate method described by Bodine [*R.A.M.*, xi, p. 169], or modifications thereof, in the culture of other species of *Tilletia* besides *T. tritici* and *T. levis* [*T. caries* and *T. foetens*], as *T. horrida* [see below, p. 324], *T. holci*, and *T. asperifolia* were found to discharge their secondary conidia in a manner similar to that described by the writer and A. H. R. Buller (*Nature*, cxvi, p. 934, 1925) for *T. caries* and *T. foetens*. By this method monospore cultures of secondary conidia can be obtained and hybridization experiments conducted with a fair degree of facility. The method has further been adapted to the multisporous inoculation of germinating wheat seedlings by inverting a vigorously growing culture of *T. caries* or *T. foetens* and allowing secondary conidia to 'rain down' on the seedlings during the first two or three days of germination. Infection was favoured by a temperature of 10° to 14° C., and probably also by darkness. At maturity a large percentage of the seedlings were found to have developed bunted heads.

HANNA (W. F.) & POPP (W.). **The control of bunt of Wheat by seed treatment.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 68–69, 1931.

After discussing the prevalence of bunt of wheat (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] in western Canada [*R.A.M.*, x, p. 444], the authors describe control tests against the disease carried out at Winnipeg.

With seed inoculated with the spores of *T. caries* (1 part of spores to 200 parts of seed by weight) the highest percentage of bunt occurred in the untreated control rows; sprinkling the seed with formalin solution 1 in 320 gave better control than any of a large number of [named] dusts applied at the rate of 2 oz. per bushel of seed. When, however, only 1 part of spores per 1,000 of seed was used, copper carbonate dusts, monohydrated copper sulphate dust, ceresan, and vitrioline [ibid., viii, p. 299] were more effective than formalin. In another locality the formalin treatment, copper carbonate, monohydrated copper sulphate dust, and ceresan were all about equally efficacious.

HANNA (W. F.) & POPP (W.). **Control of loose smuts of Wheat and Barley by seed treatment.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 70–72, 1931.

Complete control of loose smut of wheat (*Ustilago tritici*) [*R.A.M.*, x, p. 509] in Manitoba was given in experimental trials by either of the following hot water treatments of seed of the Reward variety: (1) presoaking for 4 hours, followed by dipping

for 10 minutes in water at 125° to 135° F.; (2) soaking for 1 hour 50 minutes at 118·5°; and (3) soaking for 1 hour 35 minutes at 120°. When immersed for 10 minutes at 129° few, if any, of the seeds were killed, serious injury beginning, apparently, at temperatures above 130°.

Davydoff (P. N.). Новый способ протравливания семян. [A new method of seed disinfection.]—*Plant Protection*, Leningrad, viii, 4, pp. 415–420, 1 fig., 1931. [English summary.]

A brief description [together with a sectional drawing] is given of a machine devised by the author for the disinfection of seeds by formalin vapour, which is claimed to give particularly good results in the control of cereal smuts. The seed-grain is fed into a perforated, slightly conical, and slowly revolving cylinder, where it is exposed to the action of the vapour generated by boiling a weak solution of formalin (1 part 40 per cent. in 100 parts water). Preliminary experiments showed that the length of exposure (from 1 to 10 minutes) is not material, but that the grain, after treatment, must be covered with tarpaulins for one or two hours, after which, unless sown immediately, it should be thoroughly ventilated before storing in clean bags.

The treatment is most economical and is stated not to impair the germinability of the seed-grain. The method, for which the machine described above is designed, has been tested since 1926 in four widely separated areas of European and Asiatic Russia, and in every case has given efficient control of oat smut [*Ustilago avenae*] and wheat bunt [*Tilletia caries* and *T. foetens*].

Bogoyavlensky (A. A.). Испытание порошкообразных фунгицидов в борьбе с головней хлебов. [Tests of dust fungicides for the control of cereal smuts.]—*Plant Protection*, Leningrad, vii, 4–6, pp. 371–375, 1931.

Brief details are given of experiments in 1928 at the Bashkir [Southern Urals] Plant Protection Station on the control of cereal smuts by means of disinfection of the seed-grain with various dust fungicides. Of all the preparations tested, effective control of wheat bunt [*Tilletia caries* and *T. foetens*] was only obtained with Paris green (at the rate of 0·5 gm. per kg. grain), copper carbonate (3 gm.), a mixture of wood ash with anhydrous copper sulphate (4 gm.), and sodium arsenate (1 gm.); and of oat smut [*Ustilago avenae*] with Paris green (2 gm.) and anhydrous copper sulphate (3 gm.). Formalin gave a slightly better control of these diseases, but the difference was too small to counteract the advantages of the dust disinfection method, which did not exert any injurious or delaying action on the germination of the seed-grain.

Yu (T. F.) & Chen (H. K.). **A Chinese Wheat resistant to flag smut.**—*Phytopath.*, xxi, 12, pp. 1202–1203, 1931.

Tests conducted at Nanking, China, in 1928 and 1929 showed that the wheat selection Nanking 716 and the Australian variety Nabawa (only used in 1929) are immune from flag smut (*Urocystis tritici*) [*R.A.M.*, viii, pp. 369, 454; x, p. 782]. The Chinese selection H. 1102 showed 34·7 and 22 per cent. infection in 1928 and 1929, respectively.

Broadfoot (W. C.). **Does the Wheat plant become more susceptible to the foot-rotting fungi with increasing age?**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 92, 1931.

In a preliminary test in which pot cultures of Marquis wheat were inoculated at 10-day intervals with pathogenic cultures of *Fusarium culmorum. Helminthosporium sativum, Ophiobolus graminis*, and *Leptosphaeria herpotrichoides*, singly and in combination evidence was obtained that the wheat plant was more susceptible during the first thirty or forty days than it was later. This was confirmed by a second experiment, the later inoculations being relatively ineffective. Infection was greater when *O. graminis* was used alone than when in combination with the other species [*R.A.M.*, x, p. 719].

Russell (R. C.). **Study of take-all (Ophiobolus graminis) of Wheat. A co-operative crop sequence study for the control of take-all disease of Wheat and for the testing of varietal resistance of Wheat under field conditions.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 78–82, 2 figs., 1931.

A study of the effects of soil moisture upon the severity of take-all of wheat (*Ophiobolus graminis*) [see preceding abstract] in which Marquis seedlings were grown in vessels containing soil at different degrees of saturation, showed on three separate occasions that the incidence of infection decreased with each increase in moisture, the average disease rates for the three experiments being 85 at 30 per cent. saturation, 66 at 45 per cent. saturation, 59 at 60 per cent. saturation, and only 51 at 75 per cent. saturation. Different isolations of *O. graminis* varied markedly in their relative virulence, the new isolation, no. 6, being very virulent.

Tests of the yield of wheat grown in 1930 in plots sown to wheat and artificially inoculated with *O. graminis* in 1927 and 1928, and in 1929 left fallow or sown to wheat, barley, or oats, showed the following results (duplicate series) expressed as percentages, the yield following oats being taken as 100: summer fallow 157 and 154, wheat 59 and 61, and barley 68 and 73.

In tests of varietal susceptibility to *O. graminis* all the wheats experimented with, viz., Garnet, Marquis, Mindum, and Reward suffered heavily, the inoculated rows yielding on an average only 21 to 49 per cent. as much as the controls.

Simmonds (P. M.). **A study of the annual fungous flora of the basal parts of the Wheat plant.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 77–78, 1931.

Tables are given showing the percentages of *Helminthosporium sativum, Fusarium, Alternaria*, and *Rhizoctonia* isolated from the crowns and roots of Marquis and Kubanka wheat in the seedling, heading, and stubble stages at Saskatoon, Saskatchewan, in 1930 [*R.A.M.*, x, p. 447], while further tables summarize the total percentages of *H. sativum* and *Fusarium* spp. obtained from the same varieties grown at six widely-separated stations.

The total number of fungi isolated from the crowns increased as the season advanced. At nearly all the stations *H. sativum* was isolated more frequently from older plants than from seedlings; whilst species of *Fusarium* did not show the same consistency, being isolated in great numbers from seedlings. *H. sativum* occurred mostly on the crown (up to 64 per cent.) and only occasionally (not more than 2 per cent.) on the root, whereas the percentages for *Fusarium* were 26 to 66 and 32 to 82, respectively. *Rhizoctonia* and *Alternaria* were only occasionally isolated.

SALLANS (B. J.). **A study of the root rot problem of Wheat and Barley caused by Helminthosporium sativum in Saskatchewan.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 82–84, 1931.

In studies of various methods of inoculating wheat with *Helminthosporium sativum* [see preceding abstract] the best results were obtained by inoculating the seed while still immature in the spikelets. Sheaves of Marquis and Kubanka wheat were cut at various stages of maturity from soft to hard dough, and sprayed variously with suspensions of *H. sativum* and *Alternaria* sp., control sheaves being sprayed with water. They were then wrapped in paper and allowed to ripen in the laboratory. Three hundred seeds of each of the treatments of both varieties were then planted in sterile sand in the greenhouse; ten days later, 60 to 86 per cent. of the kernels from the sheaves inoculated with *H. sativum* had become sufficiently infected to cause non-emergence seedling blight, or varying degrees of coleoptile lesioning. Isolations proved that the *Alternaria* was not responsible for any of the lesions.

Greenhouse inoculations of wheat seed with *H. sativum* grown on oat hull mash, in which temperature tanks regulated to 12°, 18°, 24°, and 30° C., respectively, were used, resulted in such marked non-germination and non-emergence that no clear-cut differences were apparent at any of the various temperatures and soil moistures. Slight differences in the very high disease rates indicated that 18° was the most favourable temperature. Variations in moisture ranging from 40 to 80 per cent. of the moisture-holding capacity of the soil produced no noticeable differences in the amount of infection which developed.

A test made to ascertain the effect of inoculation of wheat with *H. sativum* at different dates of seeding (1st and 22nd May and 12th June) showed that the later dates of seeding resulted in much greater infection than the first date. A direct correlation was established between the soil temperatures at the dates of seeding and the amount of damage due to the inoculations. This result suggests the advisability of early seeding to escape serious seedling infection by *H. sativum*.

MEAD (H. W.). **A study of seed troubles in relation to root-rot of cereals.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 84–89, 1 fig., 1 graph, 1931.

In a study of some of the diseases of barley seed in Saskatchewan

the sediment from the washing of 200 seeds from each of 15 samples of barley collected from 12 widely separated localities was examined, with the result that the spores of stem rust [*Puccinia graminis*], leaf rust [*P. anomala*], *Helminthosporium, Alternaria, Heterosporium, Fusarium, Ustilago nuda, U. hordei,* and wheat bunt [*T. caries* and *T. foetens*] as well as bacteria were found. The rust spores and those of *Heterosporium* and *U. hordei* occurred most frequently. Seedlings grown from the samples, in sterile sand, often bore lesions on the coleoptiles from which *H. sativum* was the fungus most commonly isolated, though *Fusarium* and *Alternaria* occurred as well.

The pathogenicity of some of the fungi isolated from the barley samples was tested in the greenhouse by various methods. *H. sativum* generally produced heavy infection, but only two strains of *Fusarium* caused any appreciable damage to the barley seedlings. *Alternaria* induced some lesioning of the coleoptiles and discoloration of the roots, but the fungus was not recovered from the lesions.

Barley heads inoculated with *H. sativum* [see preceding abstracts] all contained later dark brown seeds, the percentage of discoloration being greatest in inoculations made eight days after flowering, when 84 per cent. of the seeds were discoloured. *Gibberella saubinetii* (from a stock laboratory culture) caused 45 per cent. discoloration of seeds inoculated six days after flowering, the effect resembling that produced by *H. sativum.* The *Fusarium* used caused shrinking of the kernels, with slight darkening. The greatest amount of discoloration at any stage was 60 per cent. at six days. Heads inoculated with *Alternaria* one day after flowering produced 35 per cent. of kernels showing dark grey patches.

ROBERTSON (H. T.). **Histological study of the root-rots of Wheat during the post-seedling stage.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.,* pp. 93–94, 2 figs., 1931.

When the tissue of the culms and roots of foot and root rotted wheat in Alberta was examined histologically evidence was obtained that *Ophiobolus graminis* causes much more serious injury than *Fusarium culmorum* or *Helminthosporium sativum,* and is, apparently, the only one of the three organisms able to penetrate the crown and the endodermis of the roots. Infection of the crown appears invariably to arise from the subcoronal internode and the secondary roots.

A section of a primary root of wheat, thirty days old, which had been inoculated with *F. culmorum* at seeding time, showed the cortex to be disintegrated, though no mycelium was visible; the stele was intact and the wall of the endodermis greatly thickened. A comparable inoculation with *H. sativum* resulted in the cortex being mostly disorganized, and again no mycelium was apparent; peculiar isolated cells in the cortex appeared to be completely plugged with mycelium. With *O. graminis* examination of the culm just above the crown showed mycelium both in the parenchyma cells and in the xylem vessels.

GREANEY (F. J.) & MACHACEK (J. E.). **Root rot survey for Manitoba.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 76, 1931.

In 1930, foot rots caused considerable damage to wheat and barley in Manitoba, the average amount of infection in all the fields examined being estimated at roughly 15 per cent., though in some isolated spots the percentage of infection was much higher. Approximately 1,400 isolations of foot-rotting fungi were made; and out of these the number of isolations of *Fusarium* was more than twice the total number of all the other fungi collected (which included *Helminthosporium* (216 isolations), *Rhizopus* (51), *Mucor* (36), and other genera).

BROWN (A. M.). **Investigations of the dwarf leaf rust of Barley (Puccinia anomala).**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 56–57, 1931.

One hundred and fifteen varieties of barley obtained from the Manitoba Agricultural College were tested for susceptibility to four physiologic forms of *Puccinia anomala* [*R.A.M.*, x, p. 231]. Of these varieties, M.A.C. 321, Featherstone, M.A.C. 248, Keystone, Alberta Beardless, Colsess, and Mensury Ottawa 60 showed complete resistance to all four physiologic forms; M.A.C. 406, Nepal, M.A.C. 32, Swedish Gold, M.A.C. 524, Danish Island, and O.A.C. 21 showed resistance to three forms; Sacramento, Mariout, and Californian Baird were resistant to two forms; while Archer Gartons, C.D. 535, Argyle, and Latvia 2-rowed were resistant to only one form.

ROBERTSON (H. T.). **The browning root-rot disease in Alberta.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada, Dept. of Agric.*, p. 94, 1 fig., 1931.

The browning root rot disease of cereals [*R.A.M.*, ix, p. 581] was discovered on oats and wheat near Okotoks, Alberta, in 1930, the root tips of both hosts being found to contain the oospores of a *Pythium*. Wheat, oats, barley, and rye were sown in pots containing unsterilized soil from the infected field of oats, other plants being grown as controls in the same soil sterilized. After sixty days, the roots of the wheat, oats, barley, and rye in the unsterilized soil contained the characteristic oospores of the *Pythium* and showed typical browning symptoms, the wheat being the most seriously affected, while the control plants showed no oospores or browning.

TURNER (DOROTHY M.) & MILLARD (W. A.). **Leaf-spots of Oats, Helminthosporium avenae (Bri. and Cav.) Eid.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 535–558, 2 pl., 4 figs., 1931.

This is an expanded version of the first-named author's account of the leaf spot disease of oats in northern England and southwest Scotland, which has already been noticed from another source [*R.A.M.*, x, p. 515]. Besides the information already noted, it contains a brief review of the literature dealing with *Helminthosporium* diseases of cereals, and a morphological description of the British fungus which is identified as *Helminthosporium avenae*

(Bri. and Cav.) Eid. It is closely related to *H. teres*, but some morphological and considerable cultural differences indicate that it is a species distinct from the latter, and, moreover, it is not pathogenic to wheat or barley. The authors were unable to find any analogy between the mode of infection by *H. avenae* and that stated to occur in the smuts; the production of the stripe symptom is due to the coalescence of spots and is not parallel to the attack of *H. gramineum* on barley described by Smith [ibid., viii, p. 770].

O'Brien (D. G.) & Dennis (R. W. G.). **Control of leaf stripe or yellow leaf of Oats.**—*Scottish Journ. of Agric.*, xv, 1, pp. 39–45, 4 figs., 1932.

Excellent control of leaf stripe of oats [*Helminthosporium avenae*: see preceding abstract] is stated to have been obtained in Scotland over an area of 50,000 acres by seed-grain treatment with ceresan. In some cases up to four times as many plants were counted in the treated as in the untreated sections, and attention is drawn to the necessity of reducing the density of sowing by 1 to 2 bushels per acre in order to prevent overcrowding and consequent lodging. The highest increase in yield recorded was 12½ cwt. per acre (Ascot variety), representing a financial gain of about £1 per acre. Apparatus for carrying out the disinfection process may be home-made, while a machine capable of treating 15 cwt. of grain per hour is supplied by Messrs. Watson, Agricultural Engineers, Ayr, at the price of £6. The cost of the ceresan treatment is estimated at 9*d.* to 1s. per acre.

Davies (D. W.) & Jones (E. T.). **Grey speck disease of Oats.**—*Welsh Journ. of Agric.*, vii, pp. 349–358, 5 figs., 1 plan, 1931.

Since 1921, grey speck of oats [*R.A.M.*, ix, p. 741; x, p. 490] has been present every year at the Welsh Plant Breeding Station, Aberystwyth. The disease has also been recorded in Cambridgeshire, Warwickshire, Surrey, Yorkshire, and Merionethshire. In Scotland it has occurred frequently on oats in trial plots at the Edinburgh and East of Scotland College of Agriculture.

A test of varietal resistance demonstrated that Scotch Potato oats were highly resistant, Ceirch du bach and Radnorshire Sprig moderately resistant, Victory, Record, Black Tartar, and Golden Rain II moderately susceptible, and Orion highly susceptible.

In 1929, the disease was still provisionally regarded at Aberystwyth as halo blight (*Bacterium coronafaciens*) [cf. ibid., ii, pp. 208, 401], but all attempts to isolate this organism were unsuccessful, and in 1930 the possibility of seed transmission of the disease was tested with entirely negative results.

An experiment is described in which five plots each 8 by 5 ft. were sown with Orion seed on 8th April, 1930. Three days earlier two and a half plots had received a dressing of manganese sulphate, and this dressing was repeated 10 days after sowing, the total amount given being equivalent to 3 to 4 cwt. per acre. The remaining two and a half plots were left untreated. The first signs of grey speck were noted (on the controls only) on 5th June, when the treated plants were more forward, healthier, and darker

than the controls. The treated plants continued to make healthy, vigorous growth, while the controls were mostly shrivelled and brown. The plots were harvested on 1st August.

The [tabulated] data obtained showed that the application of manganese sulphate resulted in an average increased yield of 45 per cent. at harvest and 52 per cent. after drying, while the treated plots also gave a higher grain to straw ratio than the untreated, viz. 54·6 and 50·4 per cent., respectively. The relative weights per 1,000 of grains, kernels, and husks amounted to 33·2, 22·43, and 10·77 gm., respectively, for the treated plot against 29·98, 19·58, and 10·4 for the controls, whilst the corresponding husk percentages were 32·45 and 34·68.

The authors consider that the increased yield is partly due to the beneficial effect of the treatment upon growth before the onset of the disease.

Săvulescu (T.) & Rayss (T.). **Contribution à la connaissance de la biologie de Nigrospora oryzae (B. et Br.) Petch, parasite du Maïs.** [Contribution to the knowledge of *Nigrospora oryzae* (B. & Br.) Petch, parasitic on Maize.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 233–240, 5 figs., 1931.

A brief account is given of experiments which established that the serious rot of the rachids of maize by *Nigrospora oryzae* in Rumania [*R.A.M.*, x, p. 725] is primarily due to the activity of the moth *Sitotroga cerealella*, the female of which deposits her eggs inside the maize grains, and in so doing infects the cobs with spores of the fungus adhering to her body. Only fresh cobs, rich in water, are susceptible to infection, as the fungus fails to establish itself in the absence of sufficient humidity. Indirect evidence of the responsibility of the moth in carrying the disease is the fact that the variety *vulgata* of maize, the grains of which are so closely packed together in the cob that the moth cannot penetrate between them, is immune from infection. The fungus was shown not to affect the germinability of the seed-grain, as it was never found to be present in the embryo or in the endosperm, but there was positive evidence that the disease is perpetuated in the field by spores of the fungus carried by the seed, the more so since the spores are very resistant to desiccation and heat. The fungus is also capable of living in the soil saprophytically. The work indicated further that infection may occur on the standing maize, when the cobs are opened by birds and thus exposed to visitation by the moth, and also on cobs that are left on the fields in small heaps after harvest, and in storage, when the cobs are put away insufficiently dry.

Wilson (J. J.) & Reddy (C. S.). **Further studies on the fungicidal efficiency of chemical dusts containing furfural derivatives.** —*Phytopath.*, xxi, 12, pp. 1099–1113, 1931.

Among 58 different concentrations of the organic mercury compounds containing a furan ring, a concentration of 5 parts of G 1 (the precipitate formed when solutions of mercuric chloride and furfuramide are stirred together) and 95 parts of talc consistently

gave the best control of certain fungi pathogenic to maize, e.g., *Diplodia zeae*, *Basisporium gallarum* [*Nigrospora sphaerica*], and *Gibberella saubinetii*, without injurious effects on nearly disease-free seed-grain [*R.A.M.*, ix, p. 521]. When the best furan dusts and three commercial dusts were ranked in order of efficiency on the basis of acre-yield increases in each of three large field experiments [the results of which are discussed and tabulated] in 1928, it was found that treatments with compounds containing the furan ring occurred twice in the four highest in one test, four times out of four in another, and three times out of four in the remaining trial.

HOLBERT (J. R.) & KOEHLER (B.). **Results of seed-treatment experiments with yellow Dent Corn.**—*U.S. Dept. of Agric. Tech. Bull.* 260, 63 pp., 2 col. pl., 11 figs., 2 diags., 6 graphs, 1931.

A comprehensive survey, accompanied by 43 tables, is given of 11 years' experiments at the Illinois Agricultural Experiment Station and elsewhere in the United States on the control of various seed-borne diseases of maize by seed treatment, progress reports on which have been noticed from time to time in this *Review* [see preceding abstract]. Organic mercury dusts have now completely replaced the liquid fungicides in the treatment of *Diplodia zeae*, *Gibberella saubinetii*, and the other fungi occurring on maize seed, and their use is generally followed by an increased yield of some 3 bushels per acre in the case of average farmer's seed, as well as by better early vegetative growth.

STOUGHTON (R. H.). **The influence of environmental conditions on the development of the angular leaf-spot disease of Cotton. III. The influence of air temperature on infection.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 523–534, 1 pl., 3 graphs, 1931.

In continuation of his study on the development of the angular leaf spot disease of cotton (*Bacterium malvacearum*) under controlled conditions [*R.A.M.*, ix, p. 523; x, p. 26] the author describes the results of experiments which showed that high air temperatures favour the development of infection resulting from the spraying of young cotton plants (Sakellarides variety from the Gezira Plain) with a suspension of a virulent culture of *Bact. malvacearum*, the maximum infection occurring at 35° to 36° C., with decreasing incidence at progressively lower temperatures. At a constant air temperature of 39° to 40° the cotton plants did not grow and were eventually killed. The disease developed much more severely on leaves sprayed in the dark than on those that were inoculated in the light; it is believed that an explanation of this unexpected result may be found in the water relations of the host.

WILLIAMS (O. B.) & GLASS (H. B.). **Agglutination studies on Phytomonas malvaceara.**—*Phytopath.*, xxi, 12, pp. 1181–1184, 1931.

The results [which are discussed and tabulated] of agglutination experiments with 14 strains of *Phytomonas malvaceara* [*Bacterium

malvacearum] isolated from field cotton in Texas showed that a high-titred agglutinating serum can be produced for this organism [*R.A.M.*, xi, p. 176]. Cross reactions with heterologous strains of the same organism revealed considerable differences in agglutinating titre, but no fundamental serological variations between the strains used could be established by absorption tests.

EZEKIEL (W. N.) & TAUBENHAUS (J. J.). **A disease of young Cotton plants caused by Sclerotium rolfsii.**—*Phytopath.*, xxi, 12, pp. 1191–1194, 1 fig., 1931.

Cotton seedlings growing in fine sandy loam soil at College Station, Texas, were attacked in July, 1929, by *Sclerotium rolfsii* [*R.A.M.*, vii, p. 541 ; x, p. 102] which girdled the stem bases and caused the rapid wilting and death of the plants. The infected areas first developed a water-soaked appearance and then became constricted near soil level; sometimes the cortex split along the diseased portions. The fungus passed from plant to plant on or through the soil, producing the typical mycelium and sclerotia. Inoculation experiments with *S. rolfsii* from cotton and carrots [see below, p. 349] gave positive results on cotton seedlings, but tests with the same organism from carrot and guar (*Cyamopsis tetragonoloba*) on other plants were unsuccessful, and the fungus is thought to attack mature plants only rarely. Fewer plants were infected by *S. rolfsii* on plots treated with the organic mercury compounds, K-I-X, PMA, semesan, No. 664, and Bayer dust against *Phymatotrichum omnivorum*, than on control plots.

TENG (S. C.). **A preliminary report on the studies of certain diseases of Cotton.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., vi, 10, pp. 117–134, 1931.

Cyrtosis or club leaf of cotton was originally named, described, and figured by O. F. Cook [*R.A.M.*, iv, p. 167], but S. C. Wang was the first to demonstrate the association of the leafhopper (*Chlorita biguttula*) with this disease (*Rept. for 1923–4, Cotton Res. Lab., Nat. South-eastern Univ.*, 28 pp., 1924. Chinese).

An experiment to ascertain whether cyrtosis would pass from one part of a cotton plant enclosed in a glass chimney, in which leafhoppers were placed, to another, gave negative results, no cyrtosis developing on any part outside the chimney. Attempts to produce the condition in insect-proof cages by various mechanical methods were also unsuccessful. Since feeding for short periods failed to produce cyrtosis, and since the severity of the disease increased more or less directly with the number of leafhoppers feeding on the plant, it seems possible that the disorder is due merely to direct injury by the insect. Bengal cotton (*Gossypium arboreum*) was shown by a test to be resistant to cyrtosis, while eight hairy varieties of Chinese cotton (*G. nanking*) were more or less susceptible. Hairiness alone, therefore, evidently does not confer resistance to cyrtosis, which is probably associated with some inherent chemical character in the Bengal variety.

All the 50 cotton varieties tested for their reaction to 'sore shin' (*Rhizoctonia*) [*Corticium solani*: ibid., x, p. 788], viz., one of *G. hirsutum*, two of *G. arboreum*, and 47 of *G. nanking*, proved

equally susceptible to the disease. Thirteen other species of plants belonging to eight families were also found to be susceptible. Moderately good control was given by scattering naphthalene along the rows at the rate of 30 lb. per acre at planting time, followed by another 30 lb. a week after germination, as well as by ceresan and Du Bay organic mercury dust No. 738 at the rate of 6 lb. per acre.

PETCH (T.). **Isaria arachnophila Ditmar.**—*The Naturalist, 1931*, pp. 247–249, 1931.

The results of the author's investigations have shown that there are two distinct fungi on spiders in England which, since the time of Wallroth, have been confused under the name *Isaria arachnophila*. One of them is a *Hymenostilbe* [*R.A.M.*, xi, p. 241] which should be known as *H. arachnophila* (Ditm.) Petch, while the other appears to be the only European species of *Gibbellula* on spiders and should be referred to *G. aranearum* (Schw.) Syd.

SWINGLE (H. S.). **Life history of the Pecan weevil.** [*ex* Entomology.]—*Forty-second Ann. Rept. Alabama Agric. Exper. Stat. for the fiscal year ending June 30, 1931*, p. 49 [? 1931].

Pecan weevil (*Curculio caryae*) larvae were found to be infected by two fungous parasites, viz., *Metarrhizium anisopliae* [*R.A.M.*, xi, p. 179] and *Sporotrichum* [*Beauveria*] *bassiana* [ibid., x, pp. 380, 455; xi, p. 180], both of which were sufficiently promising in preliminary inoculation tests to warrant further experiments with a view to the control of the weevil.

LEFEBVRE (C. L.). **Preliminary observations on two species of Beauveria attacking the Corn borer, Pyrausta nubilalis Hübner.**—*Phytopath.*, xxi, 12, pp. 1115–1128, 3 figs., 1 graph, 1931.

This is an expanded account of the writer's comparative observations on *Beauveria bassiana* and *B. globulifera*, parasites of the European corn borer (*Pyrausta nubilalis*) in the United States [*R.A.M.*, x, p. 380].

SARTORY (A.), SARTORY (R.), MEYER (J.), & CHARLES. **Un nouveau Mycoderma pathogène: Mycoderma nobile n. sp.** [A new pathogenic *Mycoderma*: *Mycoderma nobile* n. sp.—*Ann. Mycol.*, xxix, 5–6, pp. 325–338, 6 figs., 1931.

From a tumour following a wound on the arm of a female patient, the authors isolated on carrot and other standard media a fungus characterized by extensively branched, septate hyphae, up to 5 μ in diameter, with numerous ampullae and piriform swellings. A single hypha may be divided into as many as eight segments resembling silk-worm cocoons in shape and measuring 6 to 8 by 2 to 3 μ, some of which become detached, germinate, and give rise to a septate mycelium. Sometimes the main hyphae divides at the apex into quasi-rectangular segments (7·5 by 2·5 μ). In scrapings from the arm the organism appeared exclusively in the form of spherical or ovoid elements measuring 5 by 5 or 7 by 3·5 μ. The optimum temperature for the development of the fungus, which is

named *Mycoderma nobile* n. sp. [cf. *R.A.M.*, x, p. 105], is 25° to 32° C., but it is necessary to initiate the cultures at 37° to ensure growth. The optimum hydrogen-ion concentration is P_H 6·4 to 6·8, with a range from 5·2 to 6·5. Saccharose, glucose, starch, galactose, and mannose are assimilated.

Bolley (H. L.). **Flax production in Argentina.**—*North Dakota Agric. Exper. Stat. Bull.* 253, 82 pp., 79 figs., 4 graphs, 1 map, 1931.

The large-seeded Argentine flax varieties are stated to suffer little damage from rust [*Melampsora lini*], but the small-seeded varieties, e.g., N[orth] D[akota] R[esistant] 114, Linota, and other types of Russian origin suffer as severely from this disease in Argentina as in North Dakota [*R.A.M.*, x, p. 384]. Pasmo disease [*Phlyctaena linicola*: ibid., xi, p. 45] is extremely destructive at times, causing shrivelling and scabbing of the seed; during 1930–1 this fungus caused severe injury to the late planted flax crops in Entre Rios and north Santa Fé. In the early planted areas the disease affected only the lower stem or stubble portions, whence it subsequently spread to the later planted crops, killing the upper half of the straw, blossoms, and seed bolls. The Bison and Buda varieties showed some degree of resistance to *P. linicola*. Fusarial wilt [*Fusarium lini*: ibid., xi, p. 182] caused appreciable losses only in the semi-dry land zones.

Calinisan (M. R.). **Attempts to re-establish Abacá plantations in Cavite, previously wiped out by bunchy-top.**—*Philipp. Journ. of Agric.*, ii, 3, pp. 209–221, 5 pl., 1 chart, 1931.

The results [which are discussed and tabulated] of experiments conducted since 1928 in Cavite, Philippine Islands, to determine the reaction to bunchy top of a number of introduced varieties of abacá [*Musa textilis*: *R.A.M.*, xi, p. 183] indicate that the prospects of re-establishing the devastated plantations with any of these varieties are by no means promising. On the other hand, evidence has been obtained of resistance to bunchy top in the local varieties, Sinibuyas and Kinalabao, the propagation of which is now being carried out on a large scale by the Bureau of Plant Industry. The application of commercial fertilizers failed to prevent the occurrence of bunchy top, but potassium sulphate, and to a lesser extent calcium superphosphate, delayed the early manifestations of the disease in greenhouse trials.

Calinisan (M. R.), Agati (J. A.), & Aldaba (V. C.). **Preliminary notes on the stem-rot of Abacá in the Philippines.**—*Philipp. Journ. of Agric.*, ii, 3, pp. 223–227, 3 pl., 1931.

During the early part of 1931, abacá [*Musa textilis*] plants at the Silang Experiment Station, Cavite, Philippine Islands, were affected by a hitherto unreported disease causing a rapid rotting of the leaf sheaths of the pseudo-stem which within a month or so bent over and consequently became useless for stripping. The first symptom of infection is the development of brown lesions, the size of a pin's head, on the outer sheaths. The very dark centres of the spots are surrounded by a paler area, the whole

being enclosed by a brown ring, giving a bull's eye effect. Five or more such spots usually develop close together and later coalesce to form a large, dark brown to black, oval-oblong lesion, depressed in the middle, where a cushion of greenish to brown mouldy growth is produced, and running parallel to the length of the pseudo-stem. Two or more of the lesions may develop on a single trunk, working through one leaf sheath after another towards the heart. When the fifth or sixth sheath is reached the pseudo-stem bends over from the weight of the foliage, which is usually green and healthy. The diseased sheaths shrivel, curl backwards, and droop, the breaking point mostly occurring at the chief area of girdling. Twelve varieties have been found affected by stem rot, the incidence of which is highest in Baluñganon and Balunan (46·86 and 43·77 per cent., respectively), and lowest in Sinibuyas and Kinalabao (8·92 and 4·39 per cent., respectively); the Pulian variety was also fairly resistant, with 14·43 per cent. infection. Observations in Davao in the middle of 1931 showed that the Tañgoñgon, Boñgolanon, and Maguindanao varieties also suffer from stem rot which occurred, however, in a milder form than in Cavite.

The causal fungus was isolated on steamed maize meal and grown on potato dextrose agar and oat agar. It is characterized by erect, brownish conidiophores and elongated to clavate conidia, up to 126 μ in length and with 3 to 12 or more septa. The typical stem rot symptoms developed in four to five days on six-month old, uninjured abacá plants inoculated with four- to five-day old cultures on potato dextrose agar, and also on field plants over $2\frac{1}{2}$ years old, the incubation period in the latter case being five to six days. The fungus (probably a species of *Helminthosporium*) was reisolated or recovered from each of these inoculations.

The losses from stem rot were minimized by cutting down and burning all severely diseased plants, and by early harvesting of the remainder.

PALM (B. T.). **A disease of Hibiscus sabdariffa caused by Rhodochytrium.**—*Phytopath.*, xxi, 12, pp. 1201–1202, 1931.

Attention is drawn to the occurrence on roselle (*Hibiscus sabdariffa* var. *altissima*) in 1926 on the east coast of Sumatra of the alga *Rhodochytrium spilanthidis*, causing a pronounced distortion of the top leaf blades, the lower sides of which were covered with small, bright red galls containing the resting spores and zoosporangia of the organism. Normal growth was eventually resumed above the infected region, but the affected plants remained stunted in comparison with normal ones. The sporangia of *R. spilanthidis* send haustorium-like prolongations into the fibrovascular bundles of the host, so that the presence of the alga in a plant cultivated for its fibres is clearly detrimental. Care should be taken to keep the roselle fields free from weeds, two of which, viz., *Spilanthes acmella* and *Ageratum conyzoides*, apparently acted as sources of infection by *R. spilanthidis*.

PAPE (H.). **Zur Kräuselkrankheit der Poinsettie.** [On the curl disease of Poinsettia.]—*Gartenwelt*, xxxv, 52, p. 716, 1 fig., 1931.

Further observations on the curl disease of poinsettias

[*Euphorbia pulcherrima*] in the Kiel district (Germany) [*R.A.M.*, vii, p. 246] showed that the bracts, in addition to the lower leaves, are severely distorted. Moreover, these organs were of a greenish colour with only an occasional trace of the normal vivid scarlet. The diseased plants are useless for commercial purposes.

LAUBERT (R.). **Eigenartige Krankheitserscheinungen an Syringa vulgaris.** [Peculiar pathological symptoms on *Syringa vulgaris*.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xliii (*Jahrbuch*), pp. 413–414, 1 pl. (facing p. 409), 1931.

A white lilac in the writer's garden in Berlin developed symptoms of silver leaf in May, 1931. The leaves of many of the current season's shoots were poorly developed, and the axillary buds grew prematurely into shoots with small leaves, giving an incipient witches' broom aspect to the whole twig. The floral buds were dead. On the older wood, which had been drastically pruned a few years earlier, many fruiting bodies of *Stereum purpureum* were observed.

JONES (L. R.) & RIKER (REGINA S.). **Wisconsin studies on Aster diseases and their control.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 111, 39 pp., 12 figs., 2 diags., 1931.

The cultivation of the China aster [*Callistephus chinensis*] in the United States is seriously menaced by two diseases, viz., yellows [*R.A.M.*, x, p. 734] and wilt (*Fusarium conglutinans* var. *callistephi*) [ibid., xi, p. 244]. In this bulletin the authors summarize the available information on these diseases, and discuss especially the results obtained with specific control measures. For six years yellows has been controlled in Wisconsin by the use of cloth-covered cages or houses to exclude the insect vector, *Cicadula sexnotata*, the tops and sides of the enclosures being completely covered with material not coarser than 22×22 threads per inch. The following strains of aster developed in Wisconsin are stated to combine resistance to wilt with suitable colours and habits of growth for commercial purposes: American Branching, Heart of France, Comet, Royal, and American Beauty [ibid., ix, p. 510]. The data obtained from extensive field trials by a commercial seed firm in California justify the hope that further trials on aster-sick soil will reveal the existence of numerous highly wilt-resistant strains among the standard varieties.

DRECHSLER (C.). **A crown rot of Hollyhocks caused by Phytophthora megasperma.**—*Journ. Washington Acad. Sci.*, xxi, 21, pp. 513–526, 5 figs., 1931.

Hollyhocks (*Althaea rosea*) in the District of Columbia were affected, in May and early June, 1931, by a disease which manifests itself through poor growth of new shoots, though these may reach $1\frac{1}{2}$ to 2 m. high before any symptoms are seen. Ordinarily the shoots fall over, one after another, without warning and within a few days the entire growth from a well-developed crown may be killed. Examination of the underground parts shows that the short stem is usually completely involved in a decay which extends into the fleshy roots, sometimes to a depth of 20 cm., with

a complete softening of the internal tissues. Usually the decay only penetrates a very short distance into the new shoots, the line of demarcation between diseased and healthy tissues being sharply defined by a dark marginal zone.

The intercellular mycelium of a *Phytophthora* was found in most of the rotted tissues, and this, on isolation, readily formed sexual organs. The oogonia range from 16 to 61 μ in diameter (average 47·4 μ) and the oospores from 11 to 54 μ (average 41·4 μ). The antheridia measure 10 to 18 μ in breadth and 14 to 20 μ in length; they are predominantly paragynous on maize meal agar, but on Lima bean agar a larger proportion were amphigynous (up to 35 per cent.). The organism is clearly homothallic, the mycelial connexion between the antheridium and oogonium being readily traceable.

The non-papillate sporangia are generally ovoid but may, like the antheridium, frequently be furnished with a distal lobe; they measure 6 to 45 μ across and are 15 to 90 μ long. The hypha supporting the sporangium is proliferous, bearing a second or third sporangium on the same axis, and measures 2 to 2·5 μ in diameter. The zoospores, of which 1 to 45 are produced in a sporangium, are reniform, longitudinally grooved, biciliate, 10 to 13 μ in diameter, germinating by 1 to 3 germ-tubes and often giving rise to a secondary zoospore either directly through an evacuation tube or by the formation of an elongated miniature sporangium 6 to 10 μ in diameter and 16 to 22 μ in length on a germ sporangiophore.

In the dimensions of its sexual organs the hollyhock *Phytophthora* approximates closely to the fungus described by Mrs. Alcock in connexion with the Lanarkshire strawberry disease (*P.* (?) *cinnamomi*) [*R.A.M.*, ix, p. 795], while in asexual reproduction it resembles *P. cryptogea*, *P. cinnamomi*, and *P. cambivora*. The writer knows of no other *Phytophthora* combining the large dimensions of the hollyhock fungus with predominantly paragynous antheridia, proliferous, non-papillate sporangia, and the absence of large globose 'chlamydospores', and the organism under discussion is therefore named *P. megasperma* n. sp.

ROBERTSON (H. T.). **The fungus Plenodomus meliloti, causing a root rot of Hollyhocks.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 23, 1931.

Plenodomus meliloti [*R.A.M.*, xi, p. 246] was isolated from the roots of hollyhocks (*Althaea rosea*) at Calgary in 1929 and was inoculated during the winter of 1929–30 into the roots of sweet clover [*Melilotus alba*] and hollyhocks with positive results. It is concluded that the fungus is pathogenic to hollyhocks under winter conditions in Canada.

TOCHINAI (Y.) & SHIMADA (S.). **Further note on Narcissus bulb-rot.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 1, pp. 23–26, 6 figs., 1931.

As a result of further investigations and consultation with Prof. J. Westerdijk, the writers have decided to re-name *Sporotrichum narcissi* and *S. radicicolum*, parasitic on *Narcissus pseudonarcissus* bulbs in Tokyo [*R.A.M.*, x, p. 246], *Trichoderma*

narcissi Tochinai et Shimada, nom. nov. and *Pachybasium bulbicolum* Tochinai, sp. nov., respectively. Amended technical descriptions of both organisms are given in Latin and English.

P. bulbicolum, a weak parasite on *Narcissus* bulbs and *Crocus* corms in association with *T. narcissi*, may be recognized by its pale yellowish-green or buff-coloured hyphae; erect, hyaline, branched conidiophores, 4·5 to 5·2 μ wide, bearing laterally or terminally piriform sterigmata, measuring 4·5 to 9·5 by 3·3 to 5 μ, mostly 5·5 by 3·5 μ, the short branches of the conidiophores and sterigmata being sometimes verticillate; and oval or ellipsoid, pale yellowish-green or subhyaline conidia, 2·5 to 4·5 by 1·8 to 3 μ, produced on the attenuated ends of the sterigmata.

DORPH-PETERSEN (K.). **Beretning fra Statsfrøkontrollen for det 60. Arbejdsaar fra 1 Juli 1930 til 30 Juni 1931.** [Report of the State Seed Testing Service for the 60th year of activity from 1st July, 1930, to 30th June, 1931.]—*Tidsskr. for Planteavl*, xxxvii, 5, pp. 799–871, 1931.

Section ix of this report (pp. 845–848) contains the following items of phytopathological interest [cf. *R.A.M.*, ix, p. 387]. Sclerotia of *Claviceps purpurea* were found in 17 out of 176 samples of timothy [*Phleum pratense*] seed, 4 out of 268 of rye grass [*Lolium perenne*], 2 out of 124 meadow fescue [*Festuca pratensis*], 1 out of 95 field brome [*Bromus arvensis*], 25 out of 82 oat grass [*Avena elatior*], 12 out of 150 cock's-foot grass [*Dactylis glomerata*], 1 out of 32 meadow foxtail [*Alopecurus pratensis*], 17 out of 63 meadow grass [*Poa pratensis*], 16 out of 59 rough-stalked meadow grass [*P. trivialis*], 17 out of 18 soft grass [*Holcus lanatus*], and 4 out of 9 dog's-tail grass [*Cynosurus cristatus*]. They were further found in various samples of clover seed.

Sclerotia of *Sclerotinia trifoliorum* were detected in 29 out of 486 samples of red clover seed, once in samples of white and crimson clover, and twice in snail's medick [*Medicago scutellata*]. *Typhula trifolii* occurred in 10 out of 860 samples of various clovers.

Ustilago perennans was found in 16 out of 82 samples of *Avena elatior*, and *U. bromivora* in 45 out of 95 *B. arvensis*. All the 18 samples of *H. lanatus* contained *Tilletia holci* spores.

Erwinia [*Phytomonas*] *rathayi* [ibid., iii, p. 18] occurred in 66 out of 150 samples of *D. glomerata*.

NASSONOFF (O. I.). Попередне повідомлення про спостереження над переноспоріозом Люцерни. [Preliminary account of observations on the downy mildew of Lucerne.]—*Наукові Записки з Цукрової Промисловости* (*Works Scient. Res. Inst. of Sugar Industry*), Kieff, xiv, 2–3, pp. 519–525, 2 graphs, 1931.

The author states that downy mildew of lucerne (*Peronospora aestivalis*) [considered by Gäumann to be the correct name for *P. trifoliorum*: *R.A.M.*, x, pp. 316, 436, 439] was very prevalent in 1931 in the Ukraine, especially on the crops of the second year of growth; the first cutting of the season was severely damaged, owing to the exceptionally high rainfall during the spring. Observations on the relative resistance to the disease of some 90

varieties of lucerne of various origin showed that the Bulgarian variety Elite of Sofia suffered least, followed by two varieties from Asia Minor; the varieties originating from Russia were also resistant, while all the American, French, Italian, English, and Asiatic varieties were heavily infected. It was also noted that low-yielding varieties appear to be more susceptible to the mildew than the more productive.

NICOLAS (G.) & AGGÉRY (Mlle). **Nouvelles observations sur les maladies bactériennes des végétaux.** [New observations on bacterial diseases of plants.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 195–203, 3 figs., 1931.

In continuation of their studies [*R.A.M.*, x, p. 462], the authors give a brief account of generalized bacterial infections observed by them on a young loquat (*Eriobotrya japonica*) tree in the grounds of the Botanical Laboratory in Toulouse, and on a number of lilac bushes in the neighbourhood of that town.

The loquat tree showed the first symptoms in 1926, which were then ascribed to a microlepidopteron (*Laspeyresia* sp.). In the spring of 1931 it put out abnormal shoots bearing deformed, yellowish leaves, which soon dropped whilst the flower buds dried up. The trunk of the tree was denuded of its bark, and bore a few cankers exuding a black, mucous liquid; a number of the twigs were dead. All the aerial organs (the roots were not examined) of the tree were found to contain large numbers of a bacterium which on agar produced small, circular, faintly pink colonies. The organism is a Gram-negative rod measuring 1·5 to 6 by 0·5 to 0·7 μ, disposed in chains simulating filaments, and slowly liquefying gelatine. It closely agrees in all its characters with *Bacillus amylovorus* [ibid., x, p. 529], with which it is provisionally identified, this being stated to be the first record of this organism in France. The pathogenicity of this bacterium was not tested.

The disease of the lilac bushes, which was observed in 1930 and 1931, is characterized by symptoms varying from a slight deformation, accompanied by brown spots, to an almost complete abortion of the leaves, which are reduced to a thread-like formation; and by a desiccation of the twigs. All the tissues of the infected organs were shown to be invaded by two forms of *Coccus*, one of which produced circular, pure white, and the other circular, yellowish-white colonies on agar. It is believed, however, that other organisms may be implicated.

PIERSTORFF (A. L.). **Studies on the fire-blight organism, Bacillus amylovorus.**—*Cornell Agric. Exper. Stat. Memoir* 136, 53 pp., 3 pl., 1931.

This is an account of the author's studies, during the years 1923 to 1926, of the fire blight (*Bacillus amylovorus*) problem in the United States. The natural occurrence of the disease is recorded on hawthorn (*Crataegus oxyacantha*) [*R.A.M.*, x, p. 319] and the rose variety Tausendschön, while inoculations were also successful on sweetbrier (*Rosa eglanteria*), some other varieties of the

cultivated rose, strawberry flowers and young green fruits, Japanese quince (*Chaenomeles lagenaria*), and *Photinia villosa*.

Cultural studies of *B. amylovorus* indicated that it can live in acid media of P_H 4·6, that it can withstand a temperature of $-183°$ C. for ten minutes, and that heating to 48° C. does not always inhibit its growth; sucrase (or invertase), maltase, inulase, and arbutase were produced by the organism, but not amylase, pectosinase, pectase, pectinase, cellulase, amygdalase, or trypsin. A toxic substance was found to be formed in green pear fruits rotted by *B. amylovorus*, which, while possessing many of the characters of a true bacterial toxin was not thermolabile nor was it inactivated when exposed to the air.

Field observations and laboratory experiments showed that the commonest mode of entrance of the organism into blossoms is through the nectariferous surfaces, but entry may also occur occasionally through the petals and styles [ibid., ix, p. 189]. Naturally infected leaves were found on pear trees infested with leafhoppers in the field, but attempts to inoculate young, rapidly growing apple and pear trees with *B. amylovorus* in the absence of the insects gave negative results [cf. loc. cit.]. For the first 24 hours from inoculation the organism progressed slowly in young apple shoots [ibid., viii, p. 250], after which, however, and for a period of eight days, it advanced at the rate of nearly 1 inch a day. Atmospheric water did not appear to spread infection from blossom to blossom. The susceptibility of the blossoms to infection decreased with their age, but pollination had little, if any, influence on their susceptibility. Viable cultures of *B. amylovorus* were isolated from hold-over cankers on twigs as small as one-fourth inch in diameter, and also from infected branches that had been kept for two years in the laboratory.

NISIKADO (Y.). **Beiträge zur physiologischen Spezialisierung einiger obstbewohnender Fusarien.** [Studies on the physiological specialization of some fruit-inhabiting *Fusaria*.]—*Ber. Ohara Inst. für Landw. Forsch.*, v, 1, pp. 107–144, 4 pl., 4 graphs, 1931.

A full account is given of the writer's comparative investigations on a number of strains of *Fusarium lateritium* Nees [*Gibberella moricola*: *R.A.M.*, viii, pp. 143, 153; xi, p. 95] and *F. oxysporum* carried out at the Biologische Reichsanstalt, Dahlem, with the object of ascertaining whether physiological-pathological races occur in these species. For this purpose the author studied six strains of *F. lateritium*, one of *F. lateritium* form 1 Wr. [see below, p. 339], five of *F. lateritium* var. *fructigenum* [formerly known as *F. fructigenum*: ibid., xi, p. 52], three of *F. oxysporum*, and two of *F. oxysporum* var. *aurantiacum*.

On such standard media as sterilized potato disks or barley ears nearly all the strains of *F. oxysporum* showed the mycelial type of growth, whereas *F. lateritium* form 1 Wr. and a citrus strain of *F. lateritium* always formed pionnotes; the remaining strains of *F. lateritium* and those of *F. lateritium* var. *fructigenum* showed partly the mycelial and partly the pionnotes or sporodochial type of development.

The minimum, optimum, and maximum temperatures for the growth of all the strains of *F. oxysporum* used in the tests were 7° to 8°, 27·5° to 29°, and 35° to 37° C., respectively. The Dutch raspberry cane strain of *F. lateritium* grew well at a low temperature, its optimum being about 23°. All the four strains of *F. lateritium* from citrus in southern Europe throve at higher temperatures than the last-named (optima 23° to 25°). *F. lateritium* form 1 Wr. and *F. lateritium* var. *fructigenum* grew best at 26°.

Not only oranges and citrons, but also apples were rotted by *F. lateritium* isolated from citrus in the southern European countries, as well as by the Dutch raspberry cane strain of this fungus. *F. lateritium* var. *fructigenum* (mycelial type) from Spanish oranges caused little injury to oranges but proved highly pathogenic to apples, whereas the reverse was the case with a strain of the same organism from a Portuguese tangerine (pionnotes type).

On the whole, the writer's conclusions regarding the pathogenicity of the different types of *F. lateritium* var. *fructigenum* (mycelial, sporodochial, pionnotes, and long-spored) agree with those reached by Brown and his collaborators [ibid., vii, p. 475]. In the case of *F. lateritium*, however, pathogenicity appeared to be independent of the condition of the fungus, an Italian sporodochial type from citrus being equally virulent as the mycelial types from Spanish oranges and from Dutch raspberry.

BENLLOCH (M.). **El moho de las frutas.** [Fruit mould.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 134–136, 2 figs., 1931.

Brief, popular notes are given on the 'mould' of apples and pears caused in Spain by *Sclerotinia fructigena*. *S. cinerea* attacks plums, cherries, and peaches in a similar manner, and *S. laxa* [*S. cinerea*: *R.A.M.*, vi, p. 619] is occasionally found on apricots. Recommendations are made for the control of these rots.

NICHOLLS (H. M.). **The life history of the black spot fungus.**—*Tasmanian Journ. of Agric.*, N.S., ii, 4, pp. 186–193, 4 figs., 1 diag., 1931.

This is a semi-popular account of the life-history of the black spot fungi of apple (*Venturia inaequalis*) and pear (*V. pirina*) in Tasmania, followed by a brief discussion of its bearing on the measures for the control of the diseases [cf. *R.A.M.*, xi, p. 112].

JOHNSTONE (K. H.). **Observations on the varietal resistance of the Apple to scab (Venturia inaequalis, Aderh.) with special reference to its physiological aspects.**—*Journ. Pomol. and Hort. Science*, ix, 3, pp. 195–227, 2 figs., 2 diags., 5 graphs, 1931.

In further investigations conducted by the author at Long Ashton into varietal resistance of apple trees to scab (*Venturia inaequalis*) [*R.A.M.*, xi, p. 48] a study was made of the toxicity to the fungus of liquids expressed from apple leaves, fruits, and twigs.

Within a wide range of variation, the leaves of resistant apple varieties yielded a liquid more toxic to the spores of *V. inaequalis*

than did the leaves of susceptible varieties. A more toxic liquid was obtained from young leaves than that obtained from old ones, and from leaves gathered in the afternoon than those gathered in the morning; highly toxic liquids were obtained from trees suffering from nitrogen deficiency. The liquids expressed from fruits varied in toxicity, those from young fruits being highly toxic.

Inoculation experiments on trees growing under various nutritional conditions showed that the period of incubation was longer in Bramley's Seedling than in Worcester Pearmain but apparently bore no relation to the nutrition of the tree. A lower proportion of infections occurred in trees of both varieties which were deficient in nitrogen or received rain water only. Individual lesions persisted longer on Worcester Pearmain than on Bramley's Seedling; persistence was remarkably short in trees deficient in nitrogen, much longer in trees deficient in potash, and somewhat longer in trees deficient in calcium and magnesium.

A toxin, possibly astringent, was removed from leaf and fruit extracts both by the addition of gelatine to the liquid and by filtration; tannic acid was remarkably toxic to the conidia of *V. inaequalis*. After being kept for some hours the expressed liquid, as a result of enzyme action, underwent a reduction in toxicity; liquids in which the enzymes were destroyed by heat or removed by alcohol showed, in general, greater toxicity than fresh extracts. No relation was established between the toxicity of the expressed liquid and its P_H value.

The general conclusion drawn from this and the author's previous work [loc. cit.] on the subject is that the ultimate character distinguishing a resistant from a susceptible variety is associated with the nature of the fluids bathing the epidermal cell walls. In a susceptible variety the fungus is able to establish itself beneath the cuticle, as a congenial environment is encountered; in a resistant variety the environment is uncongenial. The author's earlier study does not suggest that any factors associated with spore germination and penetration are in themselves adequate to distinguish resistant from susceptible varieties. Differences in the frequency with which scab is observed on certain varieties are, however, dependent on morphological host characters, protective hairs, for example, by their elimination of germinating spores, reducing the liability of an organ to become infected. In the cuticle, morphological characters changing with increasing age result in differences in the length of the period of susceptibility of some susceptible and resistant varieties. True resistance appears to depend on the physiological relations between host and parasite within the leaf. Failure of the fungus to grow beneath the cuticle is due rather to the toxicity of the sap than to the absence of suitable nourishment, though in nitrogen-deficient trees starvation phenomena may be involved.

HOCKEY (J. F.), WOOLLIAMS (G. E.), & BERKELEY (G. H.). **Seasonal development of the Apple scab fungus.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 103–105, 1931.

During 1930, the first spore discharge of *Venturia inaequalis*

[*R.A.M.*, x, pp. 82, 776] in Nova Scotia was recorded in two localities on 16th May. Though the heaviest ascospore discharge is usually anticipated just before full bloom, the period under review was exceptional in that while a heavy, prolonged ascospore discharge occurred as the bloom was beginning to open, i.e., 27th May to 2nd June, a further heavy ascospore infection period followed from 19th to 21st June. The final ejection of ascospores was recorded at Kentville on 25th June.

In New Brunswick the first ascospore discharge took place on 16th and 17th May, on which dates a total rainfall of 0·47 in. was recorded. A second period of ascospore discharge of greater intensity than the first occurred on 20th to 22nd May, and there were two additional ascospore ejections between 26th and 31st May and between 9th and 16th June. The last period showed two peaks of spore intensity on 10th and 16th June, the latter date being that of the final discharge recorded.

The first spore discharge in the Okanagan Valley, British Columbia took place at the end of April or early in May, when the trees were in the pre-pink or pink stage.

In Ontario the perithecia of *V. inaequalis* were practically mature by 5th April but dry conditions during that month delayed the initial ascospore discharge until 1st May.

RUEHLE (G. D.). **New Apple-rot fungi from Washington.**—*Phytopath.*, xxi, 12, pp. 1141–1152, 4 figs., 1931.

A list is given of 39 species of fungi isolated from stored apples in Washington from 1926 to 1929, including the following new species, technical diagnoses of which are given in English [*R.A.M.*, x, pp. 226, 674].

Cephalosporium carpogenum n. sp., a relatively infrequent weak parasite, was obtained from dark brown areas bordering worm holes or punctures. The inoculation of Jonathans at 20° C. resulted in the development in 30 days of small spots, a few of which by the end of two months had reached a diameter of 20 mm.

The conidiophores are hyaline, tapering, simple, non-septate, 1·5 to 2 μ wide at the base, and 25 to 45 μ long. The conidia are hyaline, continuous, ellipsoidal to short cylindrical, 4 to 8·5 by 1·4 to 2·8 μ, and forming small, globose heads 8 to 15 μ in diameter. The new species of *Cephalosporium* differs from *C. malorum* on stored apples in England [ibid., iv, p. 174] in its slower growth rate in culture and larger conidia (4 by 2 μ in the latter species).

Sporotrichum carpogenum n. sp., isolated from a dark brown lesion on a Jonathan apple, also grows very slowly in culture (20 mm. in 10 days), forming a greyish-olive mat with radiate furrows. The conidiophores generally measure 6 to 10 μ in length, occasionally up to 30 μ, and are swollen at the centre and tip. The subglobose to elliptical, hyaline, continuous conidia measure 2·8 to 6·4 by 1·8 to 3·5 μ and accumulate in loose clumps round the apex of the conidiophore. On inoculation into ripe Jonathans the fungus produced decay at 20° and at cold storage temperatures.

Botrytis mali n. sp. affects ripe apples similarly to *B. cinerea*, except in the absence of lenticel spotting [ibid., v, p. 746] and in the slightly slower growth of *B. mali* at all temperatures. The

erect, septate conidiophores, shorter and more branched than in *B. cinerea*, end in globose, swollen structures bearing conidia on small sterigmata about half the length of the spores. The continuous, hyaline, smoky grey conidia are ovate to ellipsoidal, usually finely apiculate at the base, and form dense heads; they measure 10 to 18 by 6·8 to 10·5 μ (average 11 to 14 by 7 to 9 μ); the black sclerotia, oval on top and flattened at the base, are usually 1 to 2 mm. in width but range from mere specks to 3 mm.

On 2 per cent. dextrose-potato agar and Czapek's solution agar *Cladosporium malorum* n. sp. [ibid., x, p. 193, 675] forms dense Roman green (Ridgway) colonies, reaching a diameter of 60 to 65 mm. in 10 days at 25°. The simple, septate, pale olive, short conidiophores produce long, branched chains of pale olive, oblong-cylindrical, smooth-walled, continuous or uni-septate conidia measuring 10 to 21 by 3 to 5 μ (average 14·7 by 3·6 μ). Apples inoculated with *C. malorum* develop dark brown lesions, the affected deeper tissues being light brown, somewhat dry, and spongy.

Mature perithecia, agreeing in the main with those originally described by Janczewski (*Bull. Internat. Acad. Sci. Cracovie*, xxvii, p. 187, 1894) as *Mycosphaerella tulasnei* [ibid., x, p. 194], developed sparsely in cultures of *C. herbarum* on maize meal and potato-dextrose agar held at low temperatures for long periods, and more abundantly on sterilized wheat leaves incubated at 8° to 10° for six months. The perithecia are black, thick-walled, broadly flask-shaped with a short neck, partially embedded in the leaf tissue and measured 150 to 250 by 100 to 150 μ. The asci are cylindrical, slightly tapering at the ends, 80 to 120 by 15 to 20 μ, while the hyaline, bicellular ascospores measure 18 to 28 by 6 to 8·5 μ.

SOLKINA (Mme A.). Сумчатая стадия **Sclerotinia fructigena Schröt.** в окрестностях Ленинграда. [The ascogenous stage of *Sclerotinia fructigena* Schröt. in the vicinity of Leningrad.] —*Plant Protection*, Leningrad, viii, 3, pp. 309–310, 1 fig., 1931.

In June, 1931, a mummied apple (Antonovka variety) was found in the neighbourhood of Leningrad, bearing four immature apothecia, which, when put in a moist chamber, in 23 days developed to full maturity. The apothecial cups were dark greyish-brown and from 0·6 to 1 cm. in diameter. The asci were cylindrical, 112 to 150 by 9 to 12 μ in diameter. The paraphyses were hyaline, and measured 130 to 180 by 3 to 4 μ. The ascospores were ovoid-elliptical, tapering at one or both ends, occasionally almost acuminate at the tips, continuous, hyaline, and 9 to 12 by 5 to 6 μ. These measurements agree with Schröter's descriptions of *Sclerotinia fructigena*, the ascigerous stage of which has been recorded again by Aderhold and Ruhland and with which the fungus found by the author is identified.

WILSON (E. E.). **A comparison of Pseudomonas prunicola with a canker-producing bacterium of stone-fruit trees in California.**—*Phytopath.*, xxi, 12, pp. 1153–1161, 1 fig., 1 graph, 1931.

A comparative study [the results of which are fully discussed

and tabulated] show that *Pseudomonas prunicola* Wormald [*R.A.M.*, xi, p. 160] very closely resembles an organism, herein designated 357, producing gummosis of plum and apricot trees in California. The latter organism differs in certain cultural details from *P. cerasi*, the reputed cause of cherry gummosis in Oregon, e.g., in the production of a yellow rather than a green discoloration in beef extract media and in its utilization of lactose and maltose. A second type of organism (506), which also causes gummosis of plums and apricots in California, is more closely allied to *P. cerasi* in respect of chromogenesis and may be identical with Goldsworthy's fluorescent type [ibid., vii, p. 563]. Both *P. prunicola* and 356 produced identical cankers and gumming on plum and cherry trees from which the organisms were re-isolated.

The writer considers that Wormald's new species, though its establishment was in all probability justified, should not be definitely accepted until the exact relationships between *P. cerasi* and the other agents of gummosis are elucidated.

DOWSON (W. J.). **The die-back disease of Apricots. Preliminary note.**—*Tasmanian Journ. of Agric.*, N.S., ii, 4, pp. 165–166, 1931.

The author states that of recent years a serious dying back of both young and old branches has appeared in Tasmania in comparatively young plantations of apricot, the cause of which has been traced to the growth into living wood of wound parasites from old pruning cuts, generally a stump where a shoot was not cut off level with the surface of the parent limb. Fruit bodies of *Nectria cinnabarina* have been frequently found associated with this trouble, and also on the heaps of prunings which are usually left lying at the edges of the orchards. The die-back can be best controlled by careful sanitation of the orchards, including the protection of pruning wounds with good white paint, and by measures directed towards promoting the health and vigour of the trees.

WORMALD (H.). **Further studies of the brown rot fungi. VI. Brown rot blossom wilt of the Morello Cherry: infection through unopened flowers.**—*Journ. Pomol. and Hort. Science*, ix, 3, pp. 232–237, 3 pl., 1931.

Morello cherries (varieties of *Prunus cerasus*) are very susceptible to attack by *Sclerotinia cinerea* forma *pruni*, which causes a blossom wilt and subsequently extends into the twigs, killing them back for several inches. Experimental evidence was obtained of the infection of unopened flowers by the fungus, and it was observed that two waves of infection may occur, one through the unopened flowers, the effect being noticed about the time when the trees come into full bloom, the other through the open flowers, when the resulting wilt of the twigs (above the infected node) occurs about a fortnight later. As the diseased twigs if left on the trees become sources of infection the following year, they should be promptly removed; spraying with Bordeaux mixture shortly before the flowers open is also advised. For these control measures to be

adequately effected Morello cherries should be grown as bush trees.

JØRGENSEN (C. A.). **Om Ribsbuskens Bladrandsyge.** [On leaf scorch of Currant bushes.]—*Tidsskr. for Planteavl,* xxxvii, 5, pp. 729–742, 8 figs., 1931.

Full details are given of the writer's three years' experiments in Denmark on the influence of various combined fertilizers on the development of leaf scorch in currants (Parker's Red variety) [*R.A.M.*, x, p. 738]. No definite conclusions can yet be drawn from these trials, but it would appear that a contributory cause of the condition is a failure to maintain the necessary balance between available potash on the one hand and nitrogen (and to some extent phosphoric acid) on the other [cf. ibid., x, p. 802]. Any excess of the latter constituents is inadvisable.

SĂVULESCU (T.) & SANDU (C.). **Micromycetes novi.** [New micromycetes.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 253–256, 3 figs., 1931.

In this paper Latin diagnoses are given of five species or varieties of parasitic fungi which are considered to be new to science, including *Gloeosporium ribis* var. *macrosporum* nov. var., which differs from the type species in its amphigenous acervuli and in its larger conidia measuring 13·2 to 26·4 by 5·7 to 7·5 μ (majority 16·5 to 20 by 6·6 μ) instead of 10 by 5 to 6 μ. This fungus was found on living gooseberry leaves in Rumania.

SKUTCH (A. F.). **The anatomy of the rhizome of the Banana in relation to infection by Panama disease.**—*United Fruit Co., Res. Dept. Bull.* 36, 7 pp., 1931. [Abs. in *Hort. Abstracts, Imper. Bureau of Fruit Production,* i, 4, p. 121, 1931.]

A description is given of the banana rhizome, with details of the technique employed in tracing the course of the vascular bundles, through the tracheids of which the Panama disease organism (*Fusarium cubense*) is stated to be chiefly carried [*R.A.M.*, x, p. 393]. The unbroken surface of the rhizome apparently presents an effective barrier to the entry of the fungus. Natural breaks in the surface develop so gradually that the production of cork beneath them keeps pace with the ruptures. Possible points of entry are the scars left by the decay of the older leaf sheaths, infection taking place during the brief period of inadequate protection between the rotting of the sheath and the formation of resistant tissues [ibid., x, p. 739].

WARDLAW (C. W.). **Banana diseases. II. Notes on 'cigar-end' (Stachylidium theobromae Turc.).**—*Trop. Agriculture,* viii, 11, pp. 293–298, 3 pl., 1931.

In this, the second paper of this series [*R.A.M.*, xi, p. 190], the author gives a fuller account of the 'cigar-end' disease of the Canary banana [*Musa cavendishii*] caused by *Stachylidium theobromae,* a brief reference to which was made in a former communication [ibid., x, p. 806]. The disease is widespread in the

tropics; it is essentially a plantation disease, as the infection originates in the perianth and spreads slowly backwards causing a tip rot which frequently involves over one-third of the finger. In Trinidad, however, infections are usually restricted and the decay of the fruit does not extend beyond 2 cm. The internal symptoms differ from most other storage rots in that the flesh does not become soft and watery, but acquires a dry, fibrous appearance. The cortical tissues, on the other hand, are very thoroughly exploited by the fungus, so that the epidermis and vascular strands are characteristically distorted.

Although inoculation experiments with *S. theobromae* conducted in Trinidad during both the dry and the wet seasons consistently gave negative results, the author considers that circumstantial evidence leaves no doubt that the disease is caused by this fungus, the morphological and cultural characters of which are discussed in some detail.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **A Sclerotinia limb blight of Figs.**—*Phytopath.*, xxi, 12, pp. 1195–1197, 1 fig., 1931.

A brief account is given of a destructive limb blight of magnolia figs [*Ficus magnolioides*] occurring in 1926 in Galveston County, Texas, where this fruit is extensively grown for canning. A sudden wilting of the foliage was followed by the death of affected branches, the trunk also being attacked in some cases and the base occasionally girdled. A thick, white fungus growth covered the water soaked diseased areas, the exterior and interior of which soon developed numerous sclerotia resembling those of *Sclerotinia sclerotiorum* [*R.A.M.*, vii, p. 727], apothecia of which were found on partly buried sclerotia in the vicinity of infected trees. Inoculation experiments with an ascospore culture of the fungus gave positive results. *Tubercularia fici* frequently overran the blighted limbs, especially the older ones, sometimes to the extent of obscuring the presence of *S. sclerotiorum*. The latter was observed in profusion on *Amaranthus reflexus*, a common orchard weed, and also on bean [*Phaseolus vulgaris*: ibid., x, p. 358] and lettuce [ibid., ix, p. 224].

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **An anthracnose of the Jujube.**—*Phytopath.*, xxi, 12, pp. 1185–1189, 2 figs., 1931.

A serious anthracnose disease of jujube (*Zizyphus jujuba*) fruit in Texas, resulting in heavy premature shedding, was found to be due, at any rate in part, to a species of *Gloeosporium* which appears to be closely related to, or identical with the apple bitter-rot organism (*Glomerella cingulata*), although the perfect stage failed to develop on the fruit or in culture. Healthy jujube fruits, apples, figs, grapes, Japanese persimmons [*Diospyros kaki*], peppers [*Capsicum annuum*], tomatoes, grapefruits, and oranges were successfully inoculated with spores from pure cultures originally isolated from the smooth or slightly sunken, circular, dark spots on jujube fruits, and the *Gloeosporium* was recovered from the infected tissues.

HORNE (W. T.) & PARKER (E. R.). **The Avocado sun-blotch disease.**—*Monthly Bull. Dept. of Agric. California*, xx, 7, pp. 447–454, 4 figs., 1931.

Further details are given concerning the sun blotch disease of avocado pear in California [*R.A.M.*, x, p. 474]. Only in severe cases do the twigs and limbs assume a decumbent habit owing to general weakness, while the foliage usually looks more or less normal. The most definite symptoms are observed on the youngest green stems of the Fuerte and similar varieties. Yellow streaks, which are often furrowed, extend for considerable distances on vigorous shoots. Sometimes several streaks unite and the whole stem turns yellowish-white, but more often the streak fades out towards the leaf base. Where the yellow colour is very vivid long cracks may form in the surface of young twigs. In the Caliente and Puebla varieties the streaks are less clearly marked, the yellow colour being diffusely mottled, so that identification is difficult. On older sun-blotched stems the bark becomes rough and thickened, while necrotic areas appear in the severely affected parts, especially on the side of the branch exposed to the sun. Probably these lesions are often mistaken for those due to ordinary sunburn. The bark of older limbs becomes very rough and in some cases shows abnormal streaking when sectioned.

Marked symptoms are exhibited by some of the fruits on diseased trees, consisting of longitudinal depressed streaks of varying width and colour—yellow in the Fuerte and nearly white to deep reddish-purple in other varieties. The streaks may extend the entire length of the fruit, starting at the stem, or they may be interrupted. On sectioning an infected Caliente fruit, areas of whiter, more opaque tissue are observed surrounding the fibres. Severely affected fruits are deformed and must be rejected in grading. The leaves are apparently normal in the Fuerte variety, but a peculiar yellowish-white variegation occurs in certain others. The Caliente and Puebla varieties may show pale blotches and much distortion of the foliage, while on Kashlar a remarkable white variegation, apparently due to sun blotch, has been observed.

The question of practical control of sun blotch by cultural measures is briefly considered.

SCHNICKER (J. L.). **Kviksølvbestemmelse i Afsvampningsmidler.** [Mercury determination in fungicides.]—*Tidsskr. for Planteavl*, xxxvii, 5, pp. 752–754, 1 diag., 1931.

The following method (devised by N. Lichtenberg, Copenhagen) has been found useful for the quantitative determination of the mercury content of tillantin C and other fungicides [cf. *R.A.M.*, x, p. 228]. A pyrex glass tube, 10 to 12 mm. in diameter, is filled with a layer of magnesium carbonate (25 mm. in height), a second layer of calcium oxide (a few millimetres), a third consisting of 3 gm. of the fungicide, 2 to 3 gm. cupric oxide, and 10 gm. calcium oxide, and a fourth of 3 to 5 cm. of calcium oxide, the whole being covered with asbestos wool. A tube is bent downwards at right angles and the mercury distilled off into a beaker and weighed. Certain modifications are necessary with ceresan owing to its

very low mercury content, and with the liquid dahmit [ibid., xi, p. 162].

Sproeien en sproeiers. [Sprays and spraying apparatus.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 33, 50 pp., 8 pl., 1931.

Popular notes are given on the control of a number of insect pests and fungous diseases of economic plants in Holland by the application of standard disinfectants. The paper further contains information on the various types of machinery in use, the cost of spraying, the correct method of execution, and other items of interest.

Bestrijding van plantenziekten in kleine tuinen. I en II. [Control of plant diseases in small gardens. I and II.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 19, 20 pp., 4 pl., 1931; 21, 22 pp., 5 pl., 1932.

Directions are given in popular terms for the control of plant diseases and pests in small gardens in Holland during (*a*) the winter, and (*b*) the growing period. The composition and application of some standard fungicides are described, with notes on the various well-known diseases against which they are effective.

HECHT (D.). **Über die Verwendung immunbiologischer Begriffe in der Phytopathologie.** [On the application of conceptions of biological immunity to phytopathology.]—*Biol. Zentralbl.*, li, 12, pp. 708–717, 1931.

This is a critical discussion of the current tendency to apply medical terminology in the phytopathological sphere, and of the consequent confusion, especially in the conceptions of active and passive immunity and kindred notions.

LOUKYANOVITCH (F. K.), LEBEDEVA (Mme L. A.), KIZERITZKY (V. A.), ERMOLAYEVA (Mme O. I.), & OBOLENSKY (S. I.). **Вредители и болезни сельско-хозяйственных растений в районе Туркестано-Сибирской железной дороги.** [Pests and diseases of agricultural crops in the region of the Turkestan-Siberian Railway.]—*Plant Protection*, Leningrad, vii, 4–6, pp. 349–360, 1931.

In this small collection of papers under the general title cited above the individual authors give notes on the chief insect pests and fungal diseases of agricultural crops observed by them in the course of a preliminary survey of the area traversed by the Turkestan-Siberian Railway. Rice—a relatively new introduction in that region, and the cultivation of which is ever extending in Russian Central Asia—suffers chiefly from attacks of *Helminthosporium oryzae* [*R.A.M.*, x, p. 759], which is stated to pass to it from barley. *Piricularia oryzae* [ibid., x, p. 337] is of rare occurrence so far, and measures should be taken to prevent its spread.

In Western Siberia, where soy-beans were tentatively introduced for the first time in 1930, all the varieties tested suffered fairly severely from a warty spotting stated to be caused by *Bacterium*

sojae [ibid., vi, p. 74]. In the region of Tashkent, a large proportion of the seedlings was killed by a *Fusarium* blight [ibid., xi, p. 88], the infection evidently being carried by the seeds which were obtained from the Russian Far East. The diseased beans are easily recognizable macroscopically, and in cases where the seed was sorted by hand before sowing the mortality of the seedlings was reduced from over 80 per cent. to almost nil. Other diseases of soy-beans which deserve serious consideration in that region are *Peronospora manshurica*, *Sclerotinia libertiana* [*S. sclerotiorum*], and a species of *Ascochyta* which attacks the pods [ibid., xi, pp. 87, 88].

Cotton in Russian Central Asia is attacked chiefly by *Fusarium vasinfectum* and bacteriosis (*Bact. malvacearum* and some other forms) [ibid., ix, p. 378]. In spite of their neglected condition, fruit trees suffer little from fungal diseases, some slight injury, however, being caused to young apple trees by powdery mildew (*Podosphaera leucotricha*). Fruit rot (*Monilia* [*Sclerotinia*] *fructigena*) only occurs in storage. Vines are frequently attacked by a species of *Fusarium* which causes debilitation and sterility of the stocks; the infection is propagated by cuttings from the diseased plants. Crown gall (*Bact. tumefaciens*) is also of fairly frequent occurrence on this host.

STEVENS (F. L.) & CELINO (M. S.). **Two diseases caused by Diplodia.**—*Philipp. Agric.*, xx, 6, pp. 370–373, 2 figs., 1931.

Tan-coloured spots up to 9 cm. or more long by 1 cm. or more wide, bordered by a brown band 1 mm. in width, which in turn is surrounded by a yellow area 1 mm. wide, are frequently observed on maize near Los Baños, Philippine Islands. The pycnidia occurring in the subepidermal tissues of the spots are dark brown and measure 180 to 260 μ in diameter; the ostiole protruding through the epidermis of either leaf surface is bordered by a narrow black ring. The dark brown, elongated, uni- or rarely biseptate spores, obtuse at each end, measure 45 to 80 by 9 μ, the septum usually being median but sometimes nearer one end of the spore. Except for the pycnidia, this disease bears a marked resemblance to the leaf blight caused by *Helminthosporium* [*turcicum*]. The fungus responsible for the tan spotting is a species of *Diplodia* considered to be identical with *D. macrospora* [*R.A.M.*, x, p. 238] notwithstanding certain slight differences, e.g., in spore length (given as 70 to 80 μ by Earle).

Luffa acutangula and *L. cylindrica* are affected by a soft, watery rot of the pericarp which progresses very rapidly through the host tissue, advancing as much as 5 cm. in 24 hours. The young pycnidia of the causal organism contain oval, unicellular, hyaline, large spores of the *Macrophoma* type, later turning dark but remaining continuous as in *Sphaeropsis*; at a more advanced stage they become uniseptate so that the fungus can finally be placed in the genus *Diplodia*. It is named *D. adelinensis* Stevens and Celino, n. sp. The pycnidia are densely black at maturity and measure 150 to 200 μ in diameter, ostiole 30 μ across, reticulations about 11 μ across. The ovoid, irregular, or inequilateral, black, uniseptate spores measure 18 to 24 by 14 μ and have a very

minutely echinulate surface. The fungus was isolated in pure culture from *L. acutangula* and produced on various agar media an abundant, hyaline, septate mycelium, inoculations with which on wounded *L. cylindrica* fruits gave positive results, the causal organism being reisolated and its pathogenicity conclusively proved by reinoculation.

BURGEFF (H.). **Organisation und Entwicklung tropischer Orchideen-Saprophyten. (Vorläufige Mitteilung.)** [Organization and development of tropical Orchid saprophytes. (Preliminary note.)]—*Ber. Deutsch. Bot. Gesellsch.*, xlix (*Generalversammlungsheft* 1), pp. 46–48, 1931.

A brief summary is given of the author's studies on the development of saprophytism in plants, carried out on material belonging to seven natural orders (including the Orchidaceae) collected by him in Java and the Philippines during 1927–8. The genera are arranged in three systematic groups showing the transition to extreme mycotrophy. The extent of saprophytic development was found to be physiologically determined by the quanity and quality of mycotrophic nutriment, i.e., in the last resort by the quality of the fungus symbiont. The *Rhizoctonia* fungi of the epiphytic and of the majority of terrestrial seedling mycotrophic-autotrophic species (semi-independent hosts) are the least efficient, being defective in the capacity for cellulose disorganization. The symbionts of the holosaprophytes are Hymenomycetes (with the mycelium showing clamp-connexions) which disintegrate the cellulose of raw humus. A case of extreme efficiency is furnished by the wood-destroying fungi, e.g., the symbiont of the holosaprophytic *Galeola hydra*, with its gigantic liana body. The physiological experimental task of substituting more powerful symbionts for relatively weak ones is accomplished in the case of *Cymbidium* by the use of *Hypochnus catonii* in place of the ordinary *R. repens* [*R.A.M.*, ix, p. 600], a process followed by a considerable extension and intensification of the coralloid holosaprophytic rhizome phase. The physiological and genetic implications of this phenomenon are concisely indicated.

ADDOMS (RUTH M.) & MOUNCE (F. C.). **Notes on the nutrient requirements and the histology of the Cranberry (Vaccinium macrocarpon Ait.) with special reference to mycorrhiza.**—*Plant Physiol.*, vi, 4, pp. 653–666, 2 pl., 2 figs., 1 diag., 1931.

Early Black cranberry plants from New Jersey bogs were grown for several months in sand cultures supplied with nutrient solutions containing nitrogen in the form of nitrate and ammonium, respectively, and with one lacking in all forms of nitrogen. Mycorrhiza were found in all the cultures, being least in evidence in the minus-nitrogen series. The small amount of vegetative growth in the minus-nitrogen cultures indicated that if nitrogen-fixation by the endophyte (*Phoma radicis*) [*R.A.M.*, viii, p. 325; ix, p. 398] occurred, it was quite inadequate as a source of nitrogen for the plants.

The mycelium of the endophyte was detected throughout the stem

system of the plant, including fruits and seeds. It forms a branching mass over the surface of the very small, hairless roots, the hyphae penetrating the epidermis and cortical parenchyma and forming mycelium in the cells. In the stem, the mycelium is most abundant in the parenchymatous cells, especially of the pith and cortex. The fungus often contains oil and glycogen, but nitrates could not be found, and the part played by the endophyte in the nitrogen metabolism of the plant has not yet been determined.

KÄRCHER (HEDWIG). **Kurze Mitteilung. Über die Kälteresistenz einiger Pilze und Algen.** [Short note. On the resistance to cold of some fungi and algae.]—*Planta*, xiv, 2, pp. 515–516, 1931.

Among other organisms surviving eight days' exposure to a temperature of $-70°$ C. and 13 hours at $-183°$ to $-192°$ on malt agar cultures in test tubes were *Collybia velutipes*, *Schizophyllum commune*, *Armillaria mellea*, *Xylaria hypoxylon*, *Aspergillus niger*, and *Penicillium glaucum* [cf. *R.A.M.*, x, p. 572].

BECQUEREL (P.). **La vie latente des spores des bactéries et des moisissures.** [The latent life of the spores of bacteria and moulds.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 303–307, 1931.

The author states that his experiments showed that slowly dried spores of *Mucor mucedo*, *Rhizopus niger* [? *nigricans*], *Sterigmatocystis nigra* [*Aspergillus niger*], *A. glaucus*, *Bacillus subtilis*, *B. megatherium*, and beer yeast, which were kept in an almost absolute vacuum inside sealed test tubes, were entirely viable at the end of two years. Neither was the viability of the mould spores impaired by plunging the tubes containing them in liquid air ($-190°$ C.) for 492 hours, and then in liquid hydrogen ($-253°$ C.) for 77 hours prior to storing [see preceding abstract]. The dried spores of *B. megatherium*, *B. subtilis*, *Penicillium* sp., and *A. glaucus* were also shown to withstand a temperature of 135° C. for five minutes inside the vacuum tubes, and the direct action of boiling water or live steam at 110° for 15 minutes, while moist heat at 120° does not always kill them in 10 minutes.

In his opinion these experiments indicate that, contrary to Van Tieghem's views, the latent life of the spores is anaerobic, and is dependent on the impermeability of their outer integuments when dry, which preserves them from the action of external agents. This explains the fact that the spores may be preserved for a long time in absolute alcohol, chloroform, and dry irrespirable gases without losing any of their germinability.

WHITEHEAD (T.) & CURRIE (J. F.). **The susceptibility of certain Potato varieties to leaf-roll and mosaic infection.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 508–520, 1 pl., 1931.

Some details are given of field experiments in 1929 conducted for the purpose of determining whether any differences existed in the susceptibility of seven named potato varieties, two of which were included in trials in 1924 [*R.A.M.*, x, p. 48], to infection with

potato mosaic and leaf roll. In order to ensure uniform chances of infection, the varieties were randomized in the plots, and the sources of infection were provided by drills of diseased plants alternating with the varieties tested. Although mosaic was transmitted generally, the symptoms were so slight that percentage infection could not be determined and the apparent vigour of the plants was not appreciably affected; the tuber yield of the infected plants was, however, reduced by 0·8 to 24·4 per cent. by weight. Leaf roll infection, on the other hand, was very heavy, most varieties showing from 90 to 100 per cent. infection of the plants, and tuber infection (as shown in 1930) ranged from 77·3 to 99·9 per cent. Both haulm and tuber infection were much heavier than in 1924, this indicating a marked dependence upon seasonal factors affecting the breeding of insect vectors.

The experiments indicated that loss in yield due to leaf roll is the most reliable criterion of the susceptibility of a given variety, the degree of stunting or the number of rolled leaves on a plant giving no reliable indication in this respect. There was also evidence that the reduction in yield is less dependent on seasonal factors than percentage haulm or tuber infection, and that figures showing such losses have a more general applicability to other localities and seasons. On this assumption a table is appended, showing the susceptibility of fifteen named varieties, based on the 1924 and 1929 trials, in which the loss of yield ranged from 97·6 (Herald) to 26 (Field Marshal) and 14 per cent. (Up-to-Date) by weight. In the Field Marshal variety heavy losses of yield occurred when the plants were simultaneously infected with leaf roll and mosaic. Large tubers from such plants produced plants showing symptoms of crinkle, while the small tubers gave apparently pure leaf roll.

WHITEHEAD (T.). **Respiration of healthy and leaf roll Potatoes.** —*Nature*, cxxviii, 3240, p. 967, 1931.

A comparative study of the respiration rates of healthy and leaf roll potatoes at Bangor, North Wales, has shown that the respiration of the immature healthy tuber is higher than after maturation in storage, and again rises with the development of sprouts. On the first unfolding of the leaves there is a very sharp rise in the respiration rate, followed by a slight, gradual fall as new tubers are formed. A similar course may be traced in the infected potato, but with important differences in detail. The diseased immature tuber respires at a higher rate than the healthy one when first lifted, then falls, on storage, to a level slightly below that of the healthy mature tuber. On sprouting, the respiration rate of the diseased tuber lags behind that of the healthy one until the sprouts break into leaf, when the great increase in the liberation of carbon dioxide observed in the healthy plant is exceeded by the diseased one. The higher respiration rate of infected foliage is evident, therefore, before the occurrence of any rolling or excess accumulation of starch in the leaves, but not necessarily before the incipient accumulation of sugar. It remains at a higher level than the respiration of the healthy plant during the rest of the growing period.

Anaerobic respiration in nitrogen is unaffected by the virus, the tuber, diseased or otherwise, producing 70 to 80 per cent. of the carbon dioxide evolved under aerobic conditions. The respiratory changes during the life of the potato could thus be represented by similar curves for anaerobic and aerobic conditions.

PORTER (D. R.). **The infectious nature of Potato calico.**—*Hilgardia*, vi, 9, pp. 277–294, 1 col. pl., 6 figs., 1931.

Some details are given of the investigation during 1929-31 at the California Agricultural Experiment Station of the potato calico disease [*R.A.M.*, x, p. 264], which is stated to be present in every important potato-producing district of the State, in some counties of which it is steadily spreading. The experiments and observations were mainly carried out with the White Rose variety, and in some cases with seedlings. The infectious nature of the disease is claimed to have been established from the fact that natural spread has been observed in the field, the features of which (distance, rapidity, and direction) would indicate that insects may serve as vectors, and from artificial inoculations which were successful with unfiltered (but not with filtered) juice from diseased plants through superficial lesions in the leaves of healthy plants caused by needle punctures, or by rubbing them with sterilized cheesecloth, or with the fingers, moistened with the infective juice. The symptoms following natural or experimental infection were identical, and the minimum incubation period was about 15 days. There was some evidence, needing further confirmation, that the disease may also be transmitted by tuber grafting, and it was shown definitely that it is perpetuated by means of seed tubers.

In a small greenhouse experiment under partially controlled conditions, the yield of plants inoculated with calico was 19 per cent. less than of control plants raised from sister tubers, compared with losses of 31 and 16 per cent. recorded in the field in 1929 and 1930, respectively.

BURR (S.). **Sprain or internal rust spot of Potato (B. rubefaciens).**—*Ann. of Appl. Biol.*, xviii, 4, pp. 521–523, 1 pl., 1931.

In this brief note the author states that he has succeeded in producing sprain or internal rust spot lesions in the progeny of healthy potato tubers (Golden Wonder and Field Marshal) by growing them in pots of sterilized earth inoculated with emulsions of *Bacterium rubefaciens* [*R.A.M.*, viii, p. 398]. He also gives details of the successful re-isolation of *B. rubefaciens* from the tubers thus infected, thus complying with Koch's third requirement for establishing the pathogenicity of this organism.

SCHLUMBERGER [O.]. **Prüfung von Kartoffelsorten auf ihr Verhalten gegen Schorf im Jahre 1931.** [Testing of Potato varieties for their reaction to scab in the year 1931.]—*Mitt. Deutsch. Landw. Gesellsch.*, xlvii, 4, pp. 55–57, 1932.

Continuing his tests on the reaction of a number of potato varieties to scab [*Actinomyces scabies*] in Germany [*R.A.M.*, x,

p. 618], the writer found that, of those tested for the third time, Ackersegen and Dauerragis were resistant, and Berlichingen, Blaue Gelbfleischige, and Bismarck fairly so; the remaining eight varieties of this group, including Cellini, Frühe Ertragreiche, Prozentragis, Goldfink, and Vesta, proved susceptible. Among the varieties in the second year of testing Ök.-Rat Mathis and Ovalgelbe were the most promising, while the best of those tried for the first time were Modrow's Aal, Volkswohl, Sandkrone, and Rotweissragis. A certain reduction in the incidence of scab was effected by applications of caustic lime at the rate of 20 or 40 doppelzentner per hect., but a general adoption of this treatment cannot be recommended in the light of present knowledge.

KÖHLER (E.). **Der Kartoffelkrebs und sein Erreger (Synchytrium endobioticum [Schilb.], Perc.).** [The Potato wart and its agent (*Synchytrium endobioticum* [Schilb.] Perc.).]—*Landw. Jahrb.*, lxxiv, 5, pp. 729–806, 7 figs., 1931.

This is a very comprehensive survey of the author's studies, at the Biologische Reichsanstalt, Berlin-Dahlem, on the wart disease of potatoes (*Synchytrium endobioticum*), notices of which have been published from time to time [*R.A.M.*, xi, p. 261]. The following are the chief headings under which the subject is discussed. (1) An introductory description of the disease and its agent. (2) History and geographical distribution of the disease. (3) Morphology, biology, systematic position, and hosts of the fungus. (4) The problem of specialization. (5) The relations between parasite and host (infection, modifications in the type of excrescence, and factors governing resistance and susceptibility). (6) Methods of inoculation and technique of varietal tests. (7) Control by selection, soil disinfection, and legislation (with the citation of a number of German regulations).

A five-page bibliography is appended.

Wart disease of Potatoes.—*Min. of Agric. Leaflet* 105, 10 pp., 2 pl., rewritten October, 1931.

This is a revised account, brought up to date, of the potato wart disease (*Synchytrium endobioticum*) already noticed from the previous issue [*R.A.M.*, viii, p. 56].

Stand des Kartoffelkrebsauftretens in Oesterreich. [Status of the incidence of Potato wart in Austria.]—*Oesterr. Zeitschr. für Kartoffelbau, 1931, Sondernummer*, p. 140, 1931.

During 1931 the situation in regard to the incidence of potato wart [*Synchytrium endobioticum*] did not alter materially in comparison with 1930 [*R.A.M.*, x, p. 125]. Fresh centres of infection were detected at Hohenems, Vorarlberg, and in two localities of Styria, but no economic importance is attached to these new developments.

NEUMANN (H.). **Ein Versuchsfeld zur Bekämpfung des Kartoffelkrebses.** [An experimental field for the control of Potato wart.]—*Oesterr. Zeitschr. für Kartoffelbau, 1931, Sondernummer*, pp. 115–116, 1931.

A field some 1,000 sq. m. in extent, infested with potato wart [*Synchytrium endobioticum*], has been set aside near Frohnleiten,

Styria, for soil disinfection experiments [*R.A.M.*, vii, p. 664]. In 1931 the field was planted with the susceptible Alma variety, the crop being harvested on 11th September. Of the 3,000 plants in the field only 35 were free from infection, and these appeared, from the shape and colour of the tubers, to belong to a different variety. About 200 kg. of potatoes were harvested, i.e. approximately the quantity used for seed. It is evident that the plot is heavily and uniformly infested by *S. endobioticum* and well adapted to soil disinfection trials.

NEUMANN (H.). **Versuch über die Wirkung von Kupferkalkbrühe in verschiedener Konzentration gegen die Krautfäule (Phytophthora infestans) der Kartoffel.** [An experiment on the action of Bordeaux mixture in varying concentrations against late blight (*Phytophthora infestans*) of the Potato.]—*Oesterr. Zeitschr. für Kartoffelbau, 1931, Sondernummer*, pp. 133–137, 1931.

The results are tabulated and briefly discussed of an experiment in Styria in the control of late blight (*Phytophthora infestans*) on Juliperle, Böhm's Allerfrüheste, and Kipfler potatoes with two applications of Bordeaux mixture at 1, 1·5, and 2 per cent. All the treated plots gave increased yields over the controls ranging from 8 to 30, mostly 10 to 20 per cent., the gain being due, not to the formation of additional tubers but to the development of an abundance of large ones during the 8 to 14 days' protraction of the growing season. No appreciable advantage was derived from the use of concentrations above 1 per cent. Tuber rot occurred only on the untreated late maturing Kipflers [*R.A.M.*, xi, p. 71].

DOWSON (W. J.) & OLDAKER (C. E. W.). **The prevention of late or Irish blight of Potatoes.**—*Tasmanian Journ. of Agric.*, N.S., ii, 4, pp. 211–214, 1931.

The damage and loss caused by late blight of potato [*Phytophthora infestans*] in Tasmania in 1930–1 is stated to have been disastrous, and the authors suspect that a new series of severe late blight years, similar to that which prevailed from 1906 to 1911, is in progress. They recommend the adoption by the potato growers of preventive measures against the trouble, including among other things a wider spacing of the potato rows in the field, in order to allow a more effective moulding of the hills, a measure which has been shown in Great Britain to afford good protection to the tubers against infection by *P. infestans* spores.

BABBITT (D. M.). **Seed Potato treatment on a large scale.**—*Amer. Potato Journ.*, viii, 12, pp. 271–272, 1931.

During the summer of 1931 the treatment of seed potatoes was carried out on a co-operative basis at Deerfield, Cumberland County, New Jersey. By the use of a motor seed treatment machine furnished with a carrier to raise the potatoes from the mercury disinfecting solution, nine farmers were enabled to treat 765 sacks (of 150 lb.) in just over seven hours. The operations were conducted by four men and a boy. The tubers treated by this

method were used for the seed potato crop which is grown in Salem and Cumberland counties during the late summer and autumn.

BUCKHURST (A. S.) & FRYER (J. C. F.). **The problem of 'Potato sickness'. A report upon certain experiments.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 584–601, 2 pl., 1931.

A detailed account is given of field investigations in Lincolnshire, Yorkshire, and Lancashire, and of experimental work at the Plant Pathological Laboratory in Harpenden during 1929 and 1930 to determine the causes of 'potato sickness' of the soil [*R.A.M.*, xi, p. 202]. Pot experiments were carried out with potato-sick soil (1) untreated, (2) sterilized, (3) sterilized and inoculated with eggs of *Heterodera schachtii*, (4) sterilized and inoculated with *Corticium solani*, and (5) sterilized and inoculated with the eelworm and *C. solani*. The plants in series (1) developed the typical symptoms, but in all the others they appeared normal. In the next year the pots were replanted without any further treatment being given, when series (2) and (4) grew normally while series (1) failed and (3) and (5) hardly made any growth at all. The authors therefore concluded that *C. solani* is not a primary cause of the condition and suggest that the disease is due to attacks of *H. schachtii* in conjunction with a soil factor (so far undetermined) which inhibits a vigorous early growth of the potato roots and which may be a nutritional defect. Of various soil dressings tested in the field none give any significant gain in crop except naphthalene on plots at Kirton.

O'BRIEN (D. G.) & PRENTICE (E. G.). **A nematode disease of Potatoes caused by Heterodera schachtii (Schmidt).**—*West of Scot. Agric. Coll. Res. Bull.* 2, 63 pp., 23 pl., 5 diag., 1931.

This is a detailed account of the authors' investigation of a serious disease of potatoes in the west of Scotland, the primary cause of which was shown to be the eelworm *Heterodera schachtii*. Diseased plants are commonly attacked by secondary organisms, among which *Rhizoctonia* [*Corticium*] *solani* is the chief. There was strong evidence that the production of 'nematode nests', i.e., localized areas in which the potato plants are very unhealthy and die off prematurely [? potato-sick soil: cf. preceding abstract], is directly related to the degree of infestation of the soil by the eelworm, accompanied by heavy infection with secondary parasites.

MILLARD (W. A.), BURR (S.), & JOHNSON (L. R.). **Potato sickness.** *Gard. Chron.*, xci, 2350, pp. 28–29, 3 figs., 1932.

Details are given of the writers' experiments to determine the relative importance of the eelworm *Heterodera schachtii*, the stem canker fungus (*Corticium solani*), and the black dot fungus (*Colletotrichum atramentarium*) in the causation of potato sickness [see preceding abstracts]. It is evident from the results of these tests (which covered a period of two years) that the disease is due mainly to the attacks of the eelworm which are often aggravated by infection of the young shoots by *Corticium solani*. The

part played in the development of potato sickness by *Colletotrichum atramentarium* is considered to be insignificant.

FUKUSHI (T.). **On the intracellular bodies associated with the dwarf disease of Rice plant.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 1, pp. 35–41, 5 figs., 1931.

Dwarf disease of rice in Japan is characterized by small, elongated, chlorotic areas along the leaf veins and by generalized stunting, followed by excessive tillering and a dark green coloration. The chlorotic areas (white in transmitted light), which develop before the leaves unfurl, elongate and extend along the leaf parallel to the midrib, forming fine, interrupted streaks, ranging from mere dots to several millimetres in length and 0·2 to 1 mm. in width. Plants infected in the initial stages of growth become severely stunted and produce only a few small, worthless panicles, if any. The disease is transmissible by the leafhopper, *Nephotettix apicalis* var. *cincticeps*, but not through the seed, the soil, or by mechanical inoculation with infected juice or leaf mutilation.

Both fresh and fixed material of dwarfed rice plants revealed round to oval or irregularly shaped bodies, measuring 3 to 10 by 2·5 to 8·5 μ and thus considerably exceeding in size the host nuclei (2·5 to 3·5 μ in diameter) near which they are situated. These structures stain readily with various reagents and are believed to be probably analogous to those associated with a number of virus diseases of plants [*R.A.M.*, ix, p. 538].

TENG (S. C.). **Observations on the germination of the chlamydospores of Tilletia horrida Tak.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., vi, 9, pp. 111–114, 1 pl., 1931.

The writer's observations in August, 1931, on the germination of chlamydospores of *Tilletia horrida* [*R.A.M.*, vii, p. 75], collected from rice in Chekiang, China, about 11 months earlier, showed that the thick wall is ruptured by the promycelium, which is mostly simple, apparently non-septate, 7 μ in diameter and 35 to 525 μ in length. The sporidia are long, cylindrical, often curved, 35 to 60 by 2 μ, and produced in whorls on the tip of the promycelium. Some of them give rise to conidia directly or to much branched hyphae bearing conidia, which are allantoid and 10 to 14 by 2 μ in diameter.

SHARPLES (A.) & SANDERSON (A. R.). **The root disease problem on old Rubber areas in Malaya.**—*Rubber Res. Inst. Malaya, Bull.* 3, 43 pp., 3 pl., 3 diags., 1931.

A full account is given of further investigations into the wet root rot of *Hevea* rubber in Malaya caused by *Ganoderma pseudoferreum* [*R.A.M.*, vi, p. 507; xi, p. 72], the results of which may briefly be summarized as follows.

The disease occurs on *Hevea* rubber from six years of age upwards but seldom becomes prominent before 10 years; it is not limited to any particular soil type or site and is by far the most important agent in the causation of root disease in old rubber trees. In one old rubber plantation 346 trees on five acres were examined, of which 67 were badly diseased, 64 by *G. pseudoferreum* and 3 by

Ustulina zonata. Counting milder cases, the total percentage of disease was nearly 60, almost all due to *G. pseudoferreum.* In an examination of 1,200 trees over 21 years of age, 77·7 per cent. of the 112 cases of root diseases found were due to this fungus. A large percentage of the diseased trees have diseased lateral roots only. The typical manner of spread is entirely by underground root contact; the uppermost laterals usually become infected along their under surface, and as they cross and come in contact with the roots of neighbouring trees these in turn become attacked by the rot. Masses of adventitious roots are formed after the disease has become severe. Extension in the bole may occur to a height of 10 ft. or more.

Single tree isolation being ineffective as a means of control, group treatment is recommended: the disease cannot be checked merely by exposing diseased laterals to a distance of two or three feet away from the bole, but it can be eradicated if expense is no object. Once the fungus penetrates the bole the tree cannot be saved. Emphasis is laid on the importance of following up and extracting diseased lateral roots during treatment, and in early cases this will enable many trees to be saved. As a wound cover a mixture of 1 pint of asphaltum (grade DX) with 1 pint of kerosene was found to be economical and effective. Diagrams are given to show the methods of isolation and treatment recommended.

DUCHÉ (J.) & HEIM (R.). **Recherches sur la flore mycologique des sols sableux.** [Researches on the fungal flora of sandy soils.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 431–458, 1 pl., 5 figs., 1931.

The mycological examination of the sandy soil of the dunes on the Cotentin peninsula [northern France] showed the presence in it of a fairly abundant fungal flora, and thirteen species of fungi were isolated and studied in culture. Most prevalent were *Actinomyces albus, Absidia glauca, Penicillium chrysogenum,* and *P. lilacinum,* the three last named in sand in the absence of all other vegetation. Very common also is *Trichoderma koningi* [*R.A.M.*, x, p. 551], which is renamed *Acrostalagmus koningi* comb. nov. on the grounds that its conidia are covered with a mucous sheath easily dissolving in water, and that the shape of its phialids is fusiform and rather rounded at the apex, instead of being oblong-conical and acuminate, as characteristic of the genus *Trichoderma.* As revised by the authors the latter genus should now only contain *T. lignorum.* The other species isolated comprise *Actinomyces griseus, Monilia* sp., *Hormodendron cladosporioides, Haplotrichum violaceum* n.sp., *Penicillium mangini* n. sp., and *Spicaria carnea* n. sp. Descriptions are given of the new species in French, and notes are added on their cultural behaviour and that of *Hormodendron cladosporioides.*

CHAPMAN (G. W.). **The relation of iron and manganese to chlorosis in plants.**—*New Phytologist,* xxx, 4, pp. 266–283, 1931.

The form of chlorosis considered in this paper, i.e., that dependent on the iron or manganese metabolism of the plant,

consists in a yellowing of the leaves accompanied, in severe cases, by partial death of the roots and premature defoliation [cf. *R.A.M.*, vi, p. 284; ix, p. 43]. The condition is only manifested in an acute form by certain plants growing on calcareous or manganiferous soils. Iron deficiency does not appear to be the primary cause of this type of chlorosis, and the present investigations were undertaken with a view to reconciling several apparent discrepancies in the current theories as to its origin.

The 'water-soluble' iron content of the soil was proved not to be directly related to chlorosis. Ash analyses showed that chlorotic wood from plants grown in the field always contains an abnormally large amount of iron, while chlorotic leaves usually contain exceptionally little; the plant as a whole contains more iron than normal. The sap from the wood of chlorotic plants is very low in iron, which is probably present in the divalent form. The hydrogen-ion concentration of the sap obtained from the wood was found to bear no relation to chlorosis. From field experiments on the transport of iron and manganese in the plant it was found that if chlorotic apple or pear trees are injected with manganese a year before spraying with iron, the latter does not spread in the leaves but produces green spots [cf. ibid., x, p. 676], a similar effect resulting from the application of a mixture of manganese and iron. Manganese (0·01 and 0·0025 gm. per l.) was found to be capable of inducing chlorosis in *Pinus maritima* without altering the iron content of the ash of the leaves or stem, which was higher, on a dry weight basis, in chlorotic than in normal plants. The manganese content of the needles was found to be much higher than that of the wood. An excess of calcium combined with manganese rapidly proved fatal, whereas without manganese large doses of calcium are tolerated.

BELL (A. F.). **Work of the Division of Pathology.**—*Thirty-first Ann. Rept. Queensland Bureau of Sugar Exper. Stat.*, pp. 37–41, 1931.

During the period under review a destructive new disease appeared on sugar-cane in the Mackay district of Queensland. It is tentatively referred to as 'dwarf disease' on account of the characteristic and very pronounced dwarfing produced. The symptoms somewhat resemble those of Fiji disease, but instead of galls the short, stiff leaves bear fine, yellowish, longitudinal stripes, quite distinct on the younger leaves but gradually becoming masked on passing to the older ones. The stripes are usually $\frac{1}{2}$ to 2 in. in length, but may reach 6 in.; they follow the direction of the veins and are about $\frac{1}{16}$ inch wide, but may run together to give comparatively broad yellowish bands, particularly at the leaf margins. The markings are always more pronounced at the base of the leaves and are rarely evenly distributed across the leaf blade. Healthy and diseased canes of all sizes are frequently found in the same stool; following these cases of apparently secondary infection, growth soon ceases, and the top of the stalk tapers off to a point, giving rise to a stiff fan-like top. The spindle and younger leaves typically become twisted and deformed and are of a lighter colour than normal. Infected cuttings produce

stools consisting of stunted, short-lived shoots which form no cane and resemble a tuft of grass. There is no marked shooting at the eyes or production of aerial roots on the part of diseased stalks, which on being cut open show no internal discoloration.

The outbreak appeared to be limited to about ten farms, with a maximum infection in any one field of under 0·5 per cent. Only the varieties P.O.J. 2714 and P.O.J. 213 (on one farm) were affected. The origin of the disease is unknown, but the available evidence strongly discounts the probability of its introduction from abroad in imported cane setts.

Gumming [*Bacterium vascularum*: *R.A.M.*, xi, p. 204] continued to be the most important cane disease in southern Queensland. The possibility of soil transmission was tested by incorporating diseased material in the soil and, after nearly three months, planting the plot with healthy setts of the susceptible varieties H.Q. 426 and B. 208. No trace of the disease resulted. A varietal resistance trial established beyond question the high resistance of P.O.J. 2878, which should play an important part in the control of the disease.

In experiments on the transmission of Fiji disease reported by Mr. R. W. Mungomery (on p. 47) one definite instance of secondary infection pointed to the common mealy bug (*Trionymus sacchari*) being responsible for the spread of the disease, but this has not yet been confirmed. *Aphis maidis*, *A. sacchari*, and *Perkinsiella saccharicida* failed to transmit infection.

Of the other items referred to in this report, it may be mentioned that the investigation of leaf scald [*Bact. albilineans*: ibid., x, p. 339] has now been constituted the chief problem of the Division of Pathology.

PRIODE (C. N.). **Notes on diseases affecting P.O.J. Canes in Cuba.**—Abs. in *Facts about Sugar*, xxvii, 3, pp. 136–137, 1932.

Addressing the Association of Sugar Technologists of Cuba in 1931, C. N. Priode stated that a few cases of mild mosaic have occurred in the normally highly resistant P.O.J. 2878 variety in heavily infected sections [*R.A.M.*, x, p. 271], but generally speaking this variety has satisfied the most exacting requirements in the field. The mosaic leaf pattern shown by P.O.J. 2878 is stated to differ from that exhibited by the other canes. Considerable stunting may accompany mosaic in P.O.J. 2714.

The F.C. seedlings, D. 109, Papua, and others are highly susceptible to eye spot [*Helminthosporium ocellum*: ibid., xi, p. 4], which spread to the P.O.J. canes near by, 2722 being the most resistant. Excepting 2221, the P.O.J. canes are highly resistant to brown stripe [*Helminthosporium stenospilum*: ibid., viii, p. 404]. At Baragua P.O.J. 2878 and 2722 were found to be very susceptible to pokkah-boeng [*Gibberella moniliformis*: ibid., xi, p. 4, and below, p. 332], but little importance is attached to this disease after four to five years' experience. Red stripe [*Phytomonas rubrilineans*: see next abstract] attacks the P.O.J. 2725, 2883, 2878, and 2727 varieties, but only in a mild form.

Root disease, associated with a combination of unfavourable

growth factors [ibid., x, p. 753], failed to affect the output of the vigorous P.O.J. canes, whereas Cristalina and others died out. The P.O.J. varieties are the only ones in Cuba showing stem galls [ibid., xi, p. 265].

MARTIN (J. P.). **Cane disease control through adjustment of plantation practices.**—*Internat. Sugar Journ.*, xxxiii, 395, pp. 531–532, 1931.

In this account of a paper read at the annual meeting of the Hawaiian sugar technologists the author, it is stated, classifies all diseases of sugar-cane as non-parasitic, parasitic, or virus in origin. Emphasis is laid upon disease resistance manifested by the host, and upon the necessity of studying the merits not only of plant canes but also of ratoons. The main body of the paper consists of two comprehensive lists, one of the diseases and their causes and the other of plantation measures for control. Thus, for example, leaf scald (*Bacterium albilineans*) [*R.A.M.*, x, p. 503] affects primarily the stalks and leaves, and is treated by planting resistant varieties, using healthy cuttings, roguing, sterilizing the knives, and subjecting the cuttings to the hot water treatment (20 minutes at 52° C.). Pahala blight [ibid., viii, p. 136], due to iron or manganese deficiency, responds to applications of manganese and sulphur. Red stripe (*Phytomonas rubrilineans*) [ibid., ix, p. 407; x, pp. 128, 751] is primarily a leaf disease: treatment consists in planting resistant varieties, in adopting suitable methods to favour cane growth, and early planting and harvesting to avoid having young cane during the rainy season.

PETRAK (F.). **Mykologische Notizen. XI.** [Mycological notes. XI.]—*Ann. Mycol.*, xxix, 5–6, pp. 339–597, 1931.

Critical and taxonomic notes are given on 50 species of fungi, including a number from the West Indian region collected by Ciferri and others. The list comprises one new genus and 27 new species.

MOESZ (G.). **Mykológiai közlemények. VIII. Közlemény.** [Mycological notes. Note VIII.]—*Bot. Közlemények*, xxviii, 6, pp. 161–174, 11 figs., 1931. [German summary.]

Latin diagnoses are given of some new species of fungi collected in Hungary. Among others the following may be mentioned. *Diplodina agaves* Moesz & Göllner forms subspherical, greyish-brown spots with brown margins, 4 to 7 cm. in diameter, on living leaves of *Agave americana*. The pycnidia are black, with a conical or papilliform ostiole, 187 to 312 μ in diameter, and the conidia elliptical to cylindrical, rounded at both ends, straight or slightly curved, with one median septum, bi- to pluriguttulate, measuring 12·5 to 15 by 3 to 4·5 μ. *Colletotrichum digitalis* (which name the author gives to E. Rostrup's *Gloeosporium digitalis*) was found on cultivated *Digitalis ferruginea*.

UNAMUNO (L. M.). **Notas micológicas.** [Mycological notes.]—*Bol. Soc. Españ. Hist. Nat.*, xxxi, 10, pp. 701–710, 1931.

Continuing his descriptions of fungi collected in various parts of Spain [*R.A.M.*, x, p. 210], the writer gives Latin diagnoses of

seven new species, of which the following may be mentioned. *Phyllosticta halepensis,* occurring on the dry leaves of *Sorghum halepense* [*Andropogon halepensis*], is characterized by amphigenous, punctiform, globose or ellipsoid, black pycnidia, 62·8 to 88·5 by 68·5 to 74·5 μ in diameter; and hyaline, oblong to ellipsoid, *Macrophoma*-like, straight or curved, bi- to triguttulate pycnospores, measuring 8·5 to 12 by 3·2 to 3·8 μ. *P. lusitanica* forms reddish-brown, irregular or rounded lesions, later turning white, with a zone of various colours, on the upper side of the leaves of *Quercus lusitanica* var. *faginea.* The pycnidia are globose to conical and are sparsely distributed (10 to 16 per lesion); the pycnospores are hyaline, straight or very rarely curved, ellipsoid, oblong, or conical, bi- to triguttulate (usually the former), and measure 5·7 to 8·5 by 1·5 to 2 μ; the linear, hyaline sporophores are 10 to 14 μ long. *Septoria monspessulani* forms brownish-red, circular or angular spots, 0·5 to 1 mm. in diameter, with white centres, on living leaves of *Acer monspessulanum.* The pycnidia are sparsely distributed (1 to 2 per spot), brownish-black, sphaeroidal, and 54·2 to 57 μ in diameter; the pycnospores are hyaline, filiform, straight, curved, or flexuose, tapering towards the apex, biseptate, pluriguttulate, and measure 25 to 34·2 by 1·5 to 1·8 μ.

Other items of interest include *P. albo-maculans* on quince leaves, the fungus being new to Spain and not previously reported on this host; *S. antirrhini* on *Antirrhinum majus* [ibid., iv, p. 95]; *S. briosiana* on wheat leaves, hitherto known only from northern Italy; *S. populi* on *Populus nigra* leaves; *S. rosarum* on rose leaves [ibid., vi, p. 33], a new record for Spain; *S. salicicola* in conjunction with *Melampsora ribesii-viminalis* on leaves of *Salix viminalis* [cf. ibid., viii, p. 347]; and *Diplodia guineae* on dry leaves of *Lolium perenne,* a hitherto unreported host.

HARA (K.). **Materials for the fungus-flora of Nippon 2.**—*Fungi (Nippon Fungological Soc.)*, i, 2, pp. 13–22, 2 pl., 1 fig., 1931.

Limacinia japonica Hara n. sp., occurring on *Citrus unshiu, Eurya ochracea, E. japonica,* and *Quercus glauca,* is characterized by an amphigenous, effused mycelium; branched, septate hyphae 4 to 6 μ thick; spherical or depressed-globose, ostiolate, setose perithecia, 120 to 170 μ in diameter; ovate or elliptical asci measuring 46 to 66 by 15·4 to 35 μ, and containing 4 to 8 vermiform or cylindrical, hyaline, straight or curved, 6- to 7-septate ascospores, 28 to 37 by 5 to 8 μ.

Hypnocapnodium mikanum Hara n. sp. (*Meliola citri* p.p.) [*R.A.M.*, x, p. 492] on *C. sinensis-brasiliensis* and *C. unshiu* is characterized by a widely effused mycelium, covering the whole surface of the leaves and branches; brown, filiform, branched, septate hyphae, 3 to 7μ thick; conidia of *Triposporium* type with three or four arms; globose or depressed-globose, setose pycnidia, 150 to 200 μ in diameter; elliptical or ovate, hyaline stylospores, 3 to 6 by 1·5 to 2 μ; spherical or depressed-globose, ostiolate, setose perithecia, 110 to 150 μ in diameter; ovate, cylindrical or clavate asci, 60 to 80 by 12 to 20 μ, containing 8 elliptical or fusiform, hyaline, triseptate ascospores, 20 to 25 by 6 to 8 μ.

Aithaloderma camelliae Hara n. sp. forms black, irregular spots over the whole leaf surface of *Camellia japonica*. The spherical or depressed-spherical, dark brown, ostiolate, setose perithecia of the fungus measure 80 to 130 μ in diameter. The elongated-oval, ovate, or clavate, stipitate asci measure 32 to 50 by 16 to 24 μ and contain 2 to 5 clavate, fusiform, or cylindrical, hyaline, 5- to 6-septate ascospores, 19 to 38 by 5 to 7 μ.

The spots formed on *Citrus unshiu* by *Antennella citrina* Hara n. sp. are black, orbicular, often confluent, tomentose, and cover the whole surface of the leaves and twigs. The hyphae of the fungus are filiform, septate, branched, 3 to 4 μ in thickness, without hyphopodia. The pycnidia are cylindrical, simple or branched, and the elliptical or oval, hyaline stylospores measure 2 to 3 by 0·8 to 1 μ. The spherical or ovoid perithecia, measuring 60 to 110 μ in diameter, are furnished with a simple or branched stipe. The oval or obclavate asci are stipitate, 50 to 60 by 12 to 20 μ, and contain 3 to 6 clavate or vermiform, 5-septate, hyaline ascospores measuring 36 to 40 by 6 to 7 μ.

The following new species are also described: *Meliola osmanthi-aquifolii* on *Osmanthus aquifolium*; *H. quercifolium* on *Q. glauca* and *Q. myrsinaefolia*; *Aithaloderma phyllostachydis* on *Phyllostachys reticulata* and *Arundinaria simoni*; and *Aithaloderma japonica* and *Treubiomyces japonicus* on *Q. glauca*.

SIDERIS (C. P.). **The classification of Pythium.**—*Science*, N.S., lxxiv, 1928, pp. 596–597, 1931.

Attention is drawn to the practical inconvenience and confusion likely to result from Sparrow's proposed transference of the lobulate species of *Pythium* to *Rheosporangium* and of those with spherical sporangia to *Sphaerosporangium* [*R.A.M.*, x, p. 342]. If this system were adopted there would be danger of leaving no species in *Pythium* itself. The writer reaffirms the advantages of the classification proposed by him [ibid., ix, p. 561; xi, p. 129].

WAGER (V. A.). **Diseases of plants in South Africa due to members of the Pythiaceae.**—*S. Africa Dept. of Agric. Sci. Bull.* 105, 43 pp., 18 figs., 1931.

The Pythiaceae are stated to have received scanty attention in South Africa previous to the present investigations, which deal with a number of diseases newly recorded for the country.

Foot rot of papaw is fairly common and has usually been found to be due to *Pythium ultimum* [*R.A.M.*, x, p. 770], but *P. aphanidermatum*, *P.* (?) *splendens*, *P. irregulare* [ibid., x, p. 740], and *P. spinosum* [ibid., vii, p. 244] were also isolated from infected plants. These fungi are weak parasites that attack trees debilitated by adverse climatic or soil conditions, frost being apparently a specially important factor in promoting invasion. Foot rot is usually first observed on 1½ year-old trees, though both younger and older ones may be affected. The leaves turn yellow, die prematurely, and drop off; the newly formed foliage is abnormally small with very short petioles; most of the flowers fail to set and the fruits are small and generally do not ripen. At an advanced

stage of the disease only a small bunch of leaves remains at the apex of the trunk, and finally complete defoliation ensues. For a short distance above and below soil level the base of the trunk is soft and rotten, and diseased trees are readily pushed or blown down. Infection does not seem to spread rapidly, often occurring in quite a scattered form, while entire recovery is not uncommon. Foot rot of papaws has been reported from the western, eastern, and northern Transvaal, the Cape, and Natal. At Mount Edgecombe, the symptoms differ from those described above in the fact that the base of the trunk remained sound until the final stage, while the roots were soft and rotten. *P. ultimum* was further isolated from peanuts, witch weed (*Striga lutea*), asters (*Callistephus chinensis*), and Iceland poppies (*Papaver nudicaule*) suffering from wilt, rhubarb affected by crown rot, and sweet potato showing symptoms of soft rot [ibid., vi, p. 749]; the last-named host was also attacked by *P. aphanidermatum*. *P. ultimum* was found to remain alive for at least a year in the soil.

'Leak' or soft rot of potatoes is caused by *P. aphanidermatum* [cf. ibid., iii, p. 476], which has also been found on wilting tobacco plants. Inoculation experiments showed that this fungus is capable of causing a rapid and complete rot of potato tubers, the symptoms being most marked at a temperature of 35° C. Rhubarb in the Transvaal and Cape Provinces is occasionally infected by *Phytophthora parasitica* var. *rhei*, which causes a crown rot similar to that occurring in the United States [ibid., ii, p. 435]. *P. cambivora* was isolated from the roots of avocado trees showing symptoms of die-back in the eastern Transvaal, but the disease is considered to be primarily due to unfavourable soil conditions, since inoculation tests on young, vigorous plants gave negative results. *P.* (?) *parasitica* was isolated from a species of *Cotyledon* showing a purple discoloration of the leaves which became soft and dropped.

P. citrophthora was isolated from a grape-fruit trunk affected by gummosis and collar rot. The same organism had previously been found causing brown rot of citrus fruits, but this is the first record in S. Africa of its isolation from a diseased stem. *Pythium irregulare*, isolated from decaying citrus fruits, subsequently proved unable to produce a rot on inoculation into sound oranges.

P. (?) *artotrogus* [ibid., x, p. 740] was isolated from wilted Shirley poppies (*Papaver rhoeas*) and snapdragons (*Antirrhinum majus*) at Pretoria, but the negative results of inoculation tests suggest that the fungus is only a saprophyte on these hosts.

NISIKADO (Y.). **Vergleichende Untersuchungen über die durch Lisea fujikuroi Saw. und Gibberella moniliformis (Sh.) Winel. verursachten Gramineenkrankheiten. (Vorläufige Mitteilung.)** [Comparative investigations on the diseases of Gramineae caused by *Lisea fujikuroi* Saw. and *Gibberella moniliformis* (Sh.) Winel. (Preliminary note).]—*Ber. Ōhara Inst. für Landw. Forsch.*, v, 1, pp. 87–106, 4 pl., 2 graphs, 1931.

Inoculation experiments were carried out at the Biologische Reichsanstalt, Dahlem, on rice and maize seedlings with a view to

determining the relationships between *Lisea fujikuroi* and *Gibberella moniliformis* [*R.A.M.*, ix, p. 54; x, p. 626], as well as those of their imperfect stages to other representatives of the *Fusarium moniliforme* group.

Not only *L. fujikuroi*, the causal organism of the 'bakanae' disease of rice, but also *F. moniliforme* var. *majus*, the agent of pokkah-boeng of sugar-cane [see above, p. 327], produce hypertrophy of both rice and maize seedlings. Notwithstanding slight differences of pathogenicity in the various isolations of these two fungi, there seems to be no justification for their separation under different names.

The author considers that the pathological evidence obtained from these experiments agrees with Wollenweber's views that *F. moniliforme* var. *majus* is the conidial form of *L. fujikuroi*, and that the latter should be transferred to the genus *Gibberella* as *G. fujikuroi* (Saw.) Wr., not to be confused with *G. moniliformis*.

[This paper is also published in *Zeitschr. für Parasitenkunde*, iv, 2, pp. 285–300, 2 figs., 2 graphs, 1932.]

WHITE (DOROTHY M.). **(Uredinales) Host-index.**—*North American Flora*, vii, 13, pp. 849–969, New York Botanical Garden, 1931.

An alphabetical list is given of the hosts of the Uredinales enumerated in previous parts of the North American Flora [*R.A.M.*, vii, p. 61].

HIRATSUKA (N.). **Bibliography of Uredinales in Japan.**—*Fungi* (*Nippon Fungological Soc.*), i, 2, pp. 2–8, 1931.

This continuation of the bibliography of Uredinales in Japan [*R.A.M.*, xi, p. 128] comprises 113 titles of papers published between the years 1912 and 1924.

HIRATSUKA (N.). **Zweiter Beitrag zur Uredineen-Flora von Südsachalin.** [Second contribution to the Uredine flora of South Saghalien.]—*Trans. Tottori Soc. Agric. Sci.*, ii, 3, pp. 233–246, 1931.

Taxonomic and geographical notes are given on a further 53 rusts occurring in South Saghalien [*R.A.M.*, ix, p. 810].

MEURS (A.). **Ziekten der Tabak.** [Tobacco diseases.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, 73, pp. 5–19, 1 diag., 1931.

During 1931 it was necessary to discard about 11 per cent. of the total number of tobacco seed-beds on 65 estates in Sumatra on account of slime disease [*Bacterium solanacearum*: *R.A.M.*, x, p. 561]. The four estates remaining free from the disease were for the greater part situated on black dust soil, while the 24 most severely affected were on sand and clay. The average percentage of slime disease on 65 estates was 10·4, the minimum being 1·4 and the maximum 30. The nine sections from which no field infection

was reported were mostly situated on primeval forest or virgin soil, or on the alluvial or subhydric white soils.

Phytophthora nicotianae necessitated the clearance of some 3,300 seed-beds, chiefly in two districts on liparite soils.

Stem scorch (*Pythium* spp.) occurred in over 200 seed-beds which were cleared away in consequence, and was observed on field plants on 51 estates. The disease was very troublesome on a number of estates in the plains, while on some up-country plantations on red dacite soils it involved the sacrifice of half the stand. The use of imported seedlings is believed to be largely responsible for these virulent attacks. As in 1930, the highly infectious Rotterdam B disease was chiefly observed on white alluvial soils.

The so-called 'korab' disease of tobacco [ibid., viii, p. 554] appears to be identical with the 'pock' disease described by Jensen (*Proefstat. voor Vorstenlandsche Tabak, Meded.* 40, 1920), but distinct from that reported by Iwanowski and Poloftzoff (*Mém. Acad. Imper. Sci. St. Petersburg*, Sér. 7, xxxvii, 7, 1890) which is attributed to climatic conditions.

THUNG (T. H.). **Phytopathologische Waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1 Mei 1930—30 April 1931.—*Proefstat. voor Vorstenlandsche Tabak, Meded.* 71, pp. 28–46, 3 plans, 1931.

It was ascertained in the previous year that tobacco plants affected by the 'kroepoek' [leaf curl] disease [*R.A.M.*, x, p. 61] yield less satisfactory burning material than healthy ones from the same field, a characteristic which appears from chemical analysis to be correlated with the distribution of organic substances in the leaf. The length and quality of the leaf, as well as the amount of yield, were also found to be reduced by the disease.

Details are given of the methods of controlling the lanas disease (*Phytophthora*) [*nicotianae*] by cultural practices and the eradication of diseased plants which might serve as centres of infection.

Mildew [*Erysiphe cichoracearum*] was prevalent during the period under review, and studies are in progress to discover a substance within the sulphur group combining efficacy against the fungus with economy in application.

HOLMES (F. O.). **Local lesions of mosaic in Nicotiana tabacum L.**—*Contrib. Boyce Thompson Inst.*, iii, 2, pp. 163–172, 3 figs., 1931.

In this paper [which is in continuation of his studies on the virus of tobacco mosaic: *R.A.M.*, x, p. 212] the author give details and illustrations of a method of iodine staining of inoculated leaves which renders the local lesions very conspicuous. On Turkish tobacco (*Nicotiana tabacum*), in particular, which does not develop necrotic spots on inoculation with the mosaic virus but only diffuse yellowish spots, this method showed the lesions well and revealed the points of infection even when environmental conditions were such as to render the yellowish spots indistinct or invisible in the living leaf. Staining the inoculated leaves collected

at various times of the day indicated that the virus inhibits both the formation and the translocation of starch within the infected tissues. There was also evidence that under the conditions of the experiments the virus in the lesions is locally present in high concentration.

In discussing the results of the work, it is pointed out that this method constitutes a useful means for the investigation of the movement of the virus in its host. The pattern of the lesion in stained leaves is believed not to coincide exactly with the distribution of the virus at the time of collection, but more nearly represents the location of the virus somewhat earlier.

SAMUEL (G.). **Some experiments on inoculating methods with plant viruses, and on local lesions.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 494–507, 3 pl., 1931.

The results of the experiments briefly described in this paper [which were conducted at the Wisconsin University] showed that in addition to tobacco mosaic [*R.A.M.*, vi, p. 501; viii, p. 138] the following viruses, namely, cucumber mosaic [ibid., x, p. 410], spot necrosis of tobacco [ibid., x, p. 682], ring spot of tobacco, *Petunia* mosaic [ibid., xi, p. 133], and yellow tobacco mosaic [ibid., x, p. 410], are more effectively transmitted to tobacco by a light rubbing of the leaves, without visible wounding, than by needle scratching. Some of these viruses form local lesions of a definite type, the character and number of which is influenced by temperature, age of the leaf inoculated, and other factors. These lesions, the development of which was studied by means of the iodine-staining method [see preceding abstract], may prove to be of value in quantitative studies of the viruses; they can be followed particularly well in the case of yellow mosaic. An intimate relation between the vascular system and the path of travel of the virus is made strikingly evident by this staining method.

LOJKIN (MARY) & VINSON (C. G.). **Effect of enzymes upon the infectivity of the virus of Tobacco mosaic.**—*Contrib. Boyce Thompson Inst.*, iii, 2, pp. 147–162, 1931.

The experiments described in some detail in this paper [the results of which are shown in tabular form] were made to determine the action of certain enzymes on the virus of tobacco mosaic, as judged from their effect on the infectivity of solutions of the acetone and lead acetate precipitates of the virus [*R.A.M.*, x, p. 761]. Under the conditions of the tests emulsin, pepsin, or yeast extract did not affect the infectivity of the virus, while trypsin markedly inactivated it, this effect being at least as strong when trypsin was used alone as in combination with other enzymes. Pancreatin was only slightly effective, and papain was especially effective in neutral phosphate solution. Erepsin reduced the infectivity of the virus only after an incubation of several days. None of the enzyme solutions inactivated the virus in untreated juice from either fresh or frozen plants, and the capacity of the enzymes to reduce the infectivity of the virus was destroyed by boiling.

The results of these experiments are believed to indicate that the tobacco mosaic virus is of the order of a simple protein, but possibly less complex.

SHEFFIELD (Miss F. M. L.). **The formation of intracellular inclusions in Solanaceous hosts infected with aucuba mosaic of Tomato.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 471–493, 9 pl., 1931.

This is a detailed and fully illustrated account of the formation of the intracellular inclusions previously briefly described in *Solanum nodiflorum* plants inoculated with aucuba mosaic of the tomato [*R.A.M.*, ix, p. 538], as seen by the author in this and in several other Solanaceous hosts, namely, *S. nigrum*, *Hyoscyamus niger*, tobacco, and tomato. In all these plants the development of the inclusions was very similar, and the investigation fully confirmed the conclusion formerly arrived at that these bodies are not living organisms, but the product of the reaction of the host cells to the virus; they may, however, contain the etiological agent of the disease. The protein crystals into which the body ultimately breaks down are stated to dissolve after some months.

In *H. niger* the intracellular inclusions are confined to the chlorotic areas where they are abundant in all tissues, while in the other species studied they are distributed over the green and the yellow tissues. They are very abundant in the hairs, less so in the epidermis, and very rare in the palisade and spongy tissues. In *H. niger* the development of the palisade tissue is arrested, but in the other species the effect on this tissue is not so obvious, although growth is retarded.

LESLEY (J. W.). **The resistance of varieties and new dwarf races of Tomato to curly top (western yellow blight or yellows).**—*Hilgardia*, vi, 2, pp. 27–44, 1931.

In tests conducted in California some tomato varieties of dwarf habit and also Red Pear, a variety of standard habit, exhibited some degree of resistance to curly top or yellows [*R.A.M.*, x, p. 415] when exposed to natural infestation by the leafhopper *Eutettix tenella*. In moderately severe epidemics the average loss of plants in five trials in four seasons in two localities amounted to 42 per cent. in resistant dwarf varieties, and 62 per cent. in the susceptible Santa Clara Canner, Norton, and Stone varieties. All the varieties became nearly 100 per cent. diseased in very severe epidemics. Attempts to obtain resistant lines from commercial varieties of standard habit failed, and no increase of resistance resulted from crossing a resistant dwarf with Red Pear. By hybridization improved dwarf varieties were obtained which may prove to be useful in localities where the disease is a serious danger.

As artificial infestation of the same varieties with infected leafhoppers gave varying results in different seasons it is not regarded as a reliable test of resistance to natural infestation. Resistance, when present, was weak and due, apparently, rather to a tendency to escape infection than to tolerance of the virus. The likelihood of infection taking place was affected by the number of leafhoppers used. When plants were artificially infected not less than 3 weeks after transplanting, the incubation period of the disease varied from 2 to at least 7 weeks. There was no significant difference in the length of this period or in the frequency of

recovery in resistant and susceptible varieties, and resistance was not increased in plants which had recovered or in their progeny.

CHATTERJEE (N. C.), DOVER (C.), HICKS (H. A. H. G.), MITCHELL (J. E. M.), SREENIVASAYA (M.), & IYENGAR (A. V. V.). **Investigations on the spike-disease of Sandal. I. Résumé of observations made to date. II. Report of progress made during the quarter ending 30th June 1931.**—*Indian Inst. of Sci., Bangalore*, 16 pp., 1931.

A general account is given of the history of spike disease of sandal [*Santalum album*], together with a brief sketch of the investigations on this problem conducted at the Indian Institute of Science in co-operation with the Madras Forest Department. The outstanding results of these researches have already been noticed [*R.A.M.*, xi, p. 81].

STAPP (C.). **Derzeitiger Stand der Erforschung des 'Ulmensterbens'.** [Present status of research on die-back of Elms.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xliii (*Jahrbuch*), pp. 334–342, 1931.

The writer summarizes and briefly discusses the leading researches of the past few years in Germany and elsewhere on the die-back of elms associated with *Graphium ulmi* [see above, p. 275]. Notes are also given on the legislative measures recently enforced against the disease in various countries.

GROVE (A.). **The Elm disease.**—*Gard. Chron.*, xc, 2343, p. 396, 1931.

According to the annual summary of the Forestry Commission on the progress of the elm disease due to *Graphium ulmi* in England [*R.A.M.*, viii, p. 342], there is no apparent abatement either in the severity of the infection or in its spread through the country. The addition of Huntingdon, Lincoln, and Monmouth to the counties already known to be infected brings the total to 33, but so far no case has been reported from Scotland. Certain areas seem to constitute centres of infection where the number of diseased trees constantly tends to increase. In all districts small, middle-aged trees are the most susceptible, and cases of apparent recovery of diseased trees have been observed in certain areas. The extraordinary virulence the disease may assume is illustrated by the death in September, 1931, of some 40-year-old trees at Redhill which showed no symptoms until the preceding June. An opportunity of testing varietal resistance to the disease [the most recent information on which is briefly summarized] is afforded by a recent outbreak in an arboretum in Norfolk containing many species and varieties of *Ulmus*.

OVERDIJKINK (G. A.). **De Iepenziekte.** [The Elm disease.]—*Nederl. Boschbouw-Tijdschr.*, iv, 12, pp. 383–389, 1931.

An account is given of the present status of the elm disease (*Graphium*) [*ulmi*] in Holland, with special reference to its practical silvicultural aspects [*R.A.M.*, xi, p. 138]. In south Limburg the magnificent elm stands of ten years ago have

practically disappeared, while North Brabant has also suffered heavy losses. Generally speaking, the disease is less prevalent in the coastal districts, though here also it is steadily increasing, especially in south Beveland. Infection almost always starts in more or less dense plantings, where it is evidently favoured by the stagnant air, a factor which also contributes to the spread of the elm sap beetles [*Scolytus scolytus*]. Recent investigations on the part played by these insects in the transmission of the disease are summarized.

In a postscript to this paper (pp. 389–391) F. W. Malsch states that an elm disease exhibition was held at Utrecht from 1st to 6th October, 1931, and visited by persons from all parts of the country.

SPAULDING (P.) & MACALONEY (H. J.). **A study of organic factors concerned in the decadence of Birch on cut-over lands in northern New England.**—*Journ. of Forestry*, xxix, 8, pp. 1134–1149, 8 figs., 1931.

In connexion with a study of the various factors concerned in the deterioration of paper and yellow birch (*Betula papyrifera* and *B. lutea*) in northern New England, *Armillaria mellea* was found in the root systems of 53 out of 305 trees examined, but always in a secondary capacity following injury from other causes. Once it has gained access to the roots, however, this fungus undoubtedly contributes to their destruction. *Libertella betulina* was constantly found on the dead twigs and branches of decadent birches in slash piles, but here again no evidence of parasitic action was obtained.

The first indication of deterioration consists of a slight thinning of the foliage in the topmost twigs. During the hot weather of midsummer the leaves are abnormally small and roll as if from drought. Short twig tips appear without leaves, and just below them the foliage is also small and rolled. Whole branches and ultimately the entire crown become involved.

LOHWAG (H.). **Mykologische Studien. VI. Spongipellis litschaueri (= Polyporus schulzeri Fr. sensu Bresadola).** [Mycological studies. VI. *Spongipellis litschaueri* (= *Polyporus litschaueri* Fr. *sensu* Bresadola).]—*Arch. für Protistenkunde*, lxxv, 3, pp. 297–312, 2 pl. facing p. 522, 2 figs., 1931.

In the course of his taxonomic notes on Polyporaceae, the author states that the examination of *Polyporus obtusus* Berk., the agent of an oak disease in the United States, shows it to possess all the characters of a *Trametes*, as indicated by Bourdot and Galzin, and it should be known as *T. obtusa*.

LUTZ (L.). **Sur la luminescence du mycélium de l'Armillariella mellea Vahl. Action des anti-oxygènes.** [On the luminescence of the mycelium of *Armillariella mellea* Vahl. Action of anti-oxidizers.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 1–4, 1931.

The author states that when pieces of wood (oak and poplar) permeated with the mycelium of *Armillariella* [*Armillaria*]

mellea and strongly phosphorescent in the dark were exposed to the action of substances known to inhibit oxidation, such as ether, benzaldehyde, ethyl aldehyde, cresol, and the like, the luminescence was suspended in a time varying from 5 to 60 minutes, and was restored when the pieces of wood were put into test tubes with an excess of oxygen [*R.A.M.*, ix, p. 278]. This fact would indicate, in his opinion, that the luminescence of the mycelium of *A. mellea* is of the nature of auto-oxidation.

BABEL (A.). **Pappelsterben.** [The dying-off of Poplars.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xliii (*Jahrbuch*), pp. 415–416, 1931.

A brief note is given on the occurrence in Westphalia of *Dothichiza populea* chiefly on young Robusta poplars [*Populus robusta*] of French origin [*R.A.M.*, xi, p. 138], the Lombardy and Canadian poplars [*P. nigra* var. and *P. canadensis*], however, being also affected [see next abstract]. The cortex becomes covered with black spots, which may finally girdle the trunk; below the diseased areas the tissue is necrotic and dark coloured. In the autumn small, round pustules are formed on the lesions and subsequently rupture, extruding the grey spores of the fungus.

QUAIRIÈRE (C. J.). **A propos d'une maladie des jeunes plantes de Peuplier du Canada.** [On a disease of young Canadian Poplars.]—*Bull. Soc. Centr. Forest. Belgique*, xxxviii, 9, pp. 391–397, 1931.

In the spring of 1929, as a result of infection by *Dothichiza populea* [see preceding abstract], a grower in the province of Liège, Belgium, lost about 800 young Canadian poplars [*Populus canadensis*] out of 1,000 planted the previous winter. The disease was further reported from Namur in the same year, and also from near Lommel, in 1930.

Of 10,000 poplar trees planted in the province of Antwerp over 2,000 were killed by *D. populea*, nearly all of them Raverdeau's poplar (*P. angulata* [var.] *robusta*). The trees were sent out from the nursery between December, 1930, and April, 1931, and the later plantings remained almost unaffected. The original nursery showed no trace of infection, and the facts that the trees had been prematurely uprooted and removed in December and that they had been brought from France with bare roots are considered to have predisposed the trees to the disease.

Directions for the control of the disease (including the removal of trees for planting not earlier than the end of December) [cf. *R.A.M.*, iii, p. 244] are briefly indicated.

WORMALD (H.) & HAMOND (J. B.). **The distribution of bacterial blight of Walnuts.**—*Gard. Chron.*, xc, 2348, pp. 476–477, 3 figs. (2 on pp. 478–479), 1931.

Bacterial blight of walnuts (*Pseudomonas* [*Bacterium*] *juglandis*) [*R.A.M.*, xi, 79] is stated to have been found in North and South America, Australia, New Zealand, South Africa, Switzerland, Italy, and Holland, as well as in England, where it has been observed on young trees at East Malling and on large established

ones in Kent, Surrey, Sussex, and Worcestershire. Recently an organism apparently identical with *Bact. juglandis* was isolated by Dufrénoy from a walnut tree in the Isère Department, France, and inoculation experiments at East Malling proved conclusively that this strain is capable of causing the typical bacterial blight lesions on the shoots, petioles, and fruits.

SMITH (C. O.) & BARRETT (J. T.). **Crown rot of Juglans in California.**—*Journ. Agric. Res.*, xliii, 10, pp. 885–904, 9 figs., 1931.

This is the full paper on the collar and root disease of the black walnuts (*Juglans californica* and *J. hindsii*) used as rootstocks for *J. regia* trees in California, an abstract from which has already been noticed [*R.A.M.*, x, p. 214]. In spite of the difficulty presented by the isolation of the pathogen, presumably owing to the toxicity of the exudate from diseased walnut tissue, evidence is convincing that the disease is caused by a species of *Phytophthora* which is provisionally identified as *P. cactorum*. For purposes of control the use of a resistant stock, the proper regulation of irrigation water, and the removal of soil to expose the crown are recommended.

WOLLENWEBER [H.]. **Fusarium an Walnuss.** [*Fusarium* on Walnut.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xliii (*Jahrbuch*), p. 447, 1931.

The examination of walnut leaves and fruits submitted by a correspondent in Berlin revealed the presence on the former of *Fusarium sambucinum* [*R.A.M.*, vi, p. 624] and on the latter of *F. lateritium* [see above, p. 306]. The occurrence of *Fusarium* on walnut fruits has been reported from France and Italy, but there is believed to be no previous record of this genus on the foliage. *F. lateritium* may well be parasitic on walnuts, since it is already known as the agent of decay in a number of fruits.

DAVIS (W. H.). **Corynose twig blight of the American Bladder Nut, Staphylea trifolia.**—*Phytopath.*, xxi, 12, pp. 1163–1171, 1 fig., 1931.

This is an expanded account of the writer's observations and experiments on the destructive twig blight of the American bladder nut (*Staphylea trifolia*) in Massachusetts caused by *Coryneum microstictum* var. *staphyleae*, the salient features of which have already been noticed [*R.A.M.*, x, p. 419].

GUINIER (P.). **Note sur deux Pucciniastrum nuisibles aux conifères.** [Note on two species of *Pucciniastrum* injurious to conifers.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 373–375, 1931.

The author states that *Pucciniastrum chamaenerii* occurs over the whole of France on firs [*Abies* spp.], wherever these trees grow in association with the alternate host (*Epilobium spicatum*) [*E. angustifolium*] of the fungus. The parasite is not of appreciable economic importance to adult trees, but severe outbreaks on young plantations, such as occurred in 1931 on areas reafforested since

the war, may result in seriously impairing the vigour of the trees. *P. padi* [*Thecopsora areolata*: *R.A.M.*, vii, pp. 33, 34; viii, p. 344] was found in 1927 and in the subsequent years on cones of *Picea excelsa* in several localities of Auvergne, where the trees were introduced some 100 years ago, but where the alternate host (*Prunus padus*) is native. It is believed that this fungus is also present in the French Alps and in the Jura.

KAMEI (S.). **A new species of Milesina parasitic on Polypodium vulgare L.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 1, pp. 27–34, 3 figs., 1931.

A technical diagnosis is given in English of *Milesina jezoensis* Kamei et Hiratsuka n. sp., collected on *Polypodium vulgare* in the Ishikari and Tokachi provinces, Japan, inoculation experiments with sporidia indicating that the alternate host is *Abies mayriana*.

The rust produces on the *Abies* subcuticular, globose spermogonia, 110 to 165 μ in width by 110 to 130 μ in height, scattered on yellowish discoloured areas; obclavate, septate spermatiophores; and oblong spermatia, 6·5 to 9 by 2 to 3 μ. The subepidermal uredosori, which occur on *P. vulgare*, are light brown to brownish-yellow, bullate, and measure 0·2 to 0·4 mm. across; the uredospores are broadly clavate, obovate to oblong-ovate, often short-stalked, 37 to 48 by 17 to 24 μ, with hyaline wall and contents. The firm, thin-walled peridia consist of isodiametric or irregularly polygonal cells, measuring 10 to 25 by 7·5 to 15 μ, and dehisce by a central pore formed under the stomatal slit. The bi- to multicellular, subglobose to oblong, thin-walled, smooth teleutospores, with radial vertical septa, are formed singly or in compact masses in the epidermal cells and measure 26 to 44·5 by 23 to 30 μ. From each cell a cylindrical to clavate, four-celled basidium is developed through a minute hole in the epidermal wall; it measures about 45 by 10 μ, and bears subglobose sporidia, 11 by 7 μ.

A table is given showing the difference between *M. jezoensis*, *M. dieteliana*, and *M. polypodophila* [*R.A.M.*, ix, p. 420].

RUMBOLD (CAROLINE T.). **Two blue-staining fungi associated with bark-beetle infestation of Pines.**—*Journ. Agric. Res.*, xliii, 10, pp. 847–873, 8 figs., 1931.

This is a detailed morphological and cultural account of the species of *Ceratostomella* which investigations since 1926 have shown to be constantly present in still living pines (*Pinus* spp.) [which are specified] in the United States, attacked by bark beetles and the sapwood of which is stained blue. The first species (*C. pini*) [*R.A.M.*, x, p. 564] grows into the sapwood from the galleries made by *Dendroctonus frontalis* in the eastern States, and by *D. brevicomis* in California and Idaho; it was also found in the sapwood of pines near Washington, D.C., that had been injured mechanically and were infested with mites and insects other than *Dendroctonus*. In pure culture these three strains of *C. pini* showed some differences. The colour of the wood stained by this species is grey, shading from a light neutral to a dark neutral grey, while the medullary rays and resin ducts appear

black. When freshly split open in a moist condition, the stained wood has a steel-blue or purplish cast. The hyphae of the fungus grow first into the parenchyma cells of the wood rays, and spread from them into the adjoining tracheids, generally through the bordered pits.

The second species was found growing from the galleries of *Ips calligraphus* and *I. grandicollis* in pines in the region from Pennsylvania to Florida. It is considered to be new to science and is named *C. ips* [a diagnosis in English being appended]. Its method of growth into the sapwood is very similar to that of the first species. In pure culture the young hyphae are hyaline, 2 to 3 μ wide, later becoming brown and 3·5 to 10·4 μ in diameter. The young conidiophores are hyaline, unbranched, and bear the conidia in clusters; later they are brown at the base, with biverticillate branches at the top, bearing solitary conidia, which collect in heads held together by a mucilaginous substance; the conidia are hyaline, obovoid to ellipsoidal, and measure 3 to 10·5 by 1 to 3 μ. The perithecia are black, globose, slightly hirsute, 96 to 320 by 55 to 301 μ (mean 206 by 198 μ) in diameter, with a neck from 215 to 3,860 μ (mean 1,273 μ) in length, and an ostiole usually without terminal filaments. The asci are ephemeral, polyhedral, 9 to 10·4 by 7 to 8 μ in diameter, and contain 8 hyaline, cylindrical or slightly curved ascospores measuring 3·3 to 4·2 by 1·2 to 2·8 μ (mean 3·8 by 2 μ). The stain caused by this fungus is slate-grey shading to slate-black, the wood rays and resin ducts appearing black; freshly stained and moist sapwood has a steel-blue cast on splitting.

OEHM (G.). **Zur Morphologie und Anatomie der Bergwerkspilze Lentinus squamosus (Schaeffer) Fries und L. squ. f. suffrutescens Brot. (Beiträge zur Kenntnis der Hymenomyceten. I.).** [On the morphology and anatomy of the mine fungi *Lentinus squamosus* (Schaeffer) Fries and *L. squamosus* f. *suffrutescens* Brot. (Contributions to the knowledge of the Hymenomycetes. I.).]—*Arch. für Protistenkunde,* lxxiii, 3, pp. 371–422, 1 pl., 20 figs., 1931.

A comprehensive account is given of the writer's studies, conducted at Prague, Czecho-Slovakia, on *Lentinus squamosus* [*L. lepideus*] [*R.A.M.*, x, p. 572] and *L. squamosus* var. *suffrutescens,* the former occurring commonly on timber above ground, while the latter predominates in mines.

The anatomical structure of both organisms was found to be identical. Above the lamellae and in the subhymenium the hyphae generally develop into cylindrical, binuclear cells, occasionally a good deal thicker than the normal, and interspersed among these are varying numbers of sap hyphae. The basidia arise from transverse hyphae or subhymenial cells.

The thickening of the hyphal walls is accompanied by a reduction of the lumen and frequently also by nodosities. The chemical nature of this process could not be fully elucidated, but the bulk of the walls was found to consist of chitin. The lumen of all the hyphae stains red with safranin.

Cartwright (K. St. G.), Findlay (W. P. K.), Chaplin (C. T.), & Campbell (W. G.). **The effect of progressive decay by Trametes serialis Fr. on the mechanical strength of the wood of Sitka Spruce.**—*Dept. of Sci. & Indus. Res., Forest Products Res. Bull.* 11, 18 pp., 4 pl., 1 fig., 6 graphs, 1931.

A full account is given of an investigation undertaken in order to ascertain the effect of attack by *Trametes serialis* on the mechanical strength of wood and the relationship thereto of changes in chemical composition and specific gravity of the wood.

The timber selected was Sitka spruce (*Picea sitchensis*) and test pieces were cut measuring $5 \times \frac{3}{8} \times \frac{3}{8}$ in., carefully prepared from selected, sound wood. They were sterilized by steaming and inoculated with *T. serialis* [*R.A.M.*, ix, p. 617]. Two distinct series of mechanical tests were made, one on pieces subjected to fungal attack and the other on sterilized control pieces. The tests were carried out on a 10,000 lb. Denison Universal testing machine, using the 1/10 scale poise weight.

The results obtained [which are tabulated, expressed graphically, and discussed] showed that after two weeks' exposure to *T. serialis* the timber suffered over 15 per cent. loss in mechanical strength. The loss in strength subsequently was very rapid if favourable conditions for the growth of the fungus were maintained, and the rate of loss continued to be fairly constant until a loss was reached of 80 per cent. of the original strength values of the timber, when the rate became rather slower. The advance of the attack was indicated by a steady increase in brittleness and by the greater brashness seen in the fractures. The wood did not at first change much in its general appearance, but chemical examination showed that an increased proportion was soluble in alkali, this progressive increase in alkali solubility being very closely correlated with the falling away of the mechanical strength, as measured by the equivalent fibre strength at maximum load. There was no significant loss in dry weight until after five weeks in one experiment and after four weeks in another: thence onwards the rate of loss was fairly regular. After 10 weeks 16·4 and 14·6 per cent. dry weight, respectively, had been lost.

Decomposition (hydrolysis), as evinced by increased alkali solubility, preceded loss in weight, indicating that the fungal attack alters the wood considerably before any appreciable quantity of material is actually removed by fungal respiration and transpiration. The loss in strength is therefore apparently due to chemical action on the cell wall substance rather than to a physical breaking down of the walls by hyphal penetration.

No difference in the method of attack in the earlier and later stages could be observed microscopically; the degree of decay could be estimated only very roughly by examination of the amount of mycelium present and the condition of the cell walls.

Campbell (W. G.). **The chemistry of the white rots of wood. II. The effect on wood substance of Armillaria mellea (Vahl.) Fr., Polyporus hispidus (Bull.) Fr., and Stereum hirsutum Fr.**—*Biochem. Journ.*, xxv, 6, pp. 2023-2027, 1931.

Continuing his studies on the chemistry of the white rots of wood

[*R.A.M.*, x, p. 149], the writer examined the effects of *Armillaria mellea* on beech wood, *Polyporus hispidus* on ash heartwood, and *Stereum hirsutum* on oak sapwood. The technique of the experiments, which was similar to those previously reported, is briefly described and the results tabulated and discussed.

The three types of white rot were found to possess only one feature in common, which is shared by that due to *Polystictus versicolor*, namely, the absence of any marked increase in the total alkali solubility of the major components of wood substance. In wood rotted by *P. versicolor* and *A. mellea* this has been proved to be attributable to the diminishing solubility in 1 per cent. NaOH as decay proceeds of the pentosans outside the cellulose. The white rots in question are thus sharply differentiated from the brown rots, in some of which the residual wood substance, even in the advanced stages of decay, is much more soluble in alkali than the original sound material.

The essential similarity of the detailed chemical action on the wood substance of *Polyporus hispidus* and *S. hirsutum* has been established, but whereas these organisms attack the pentosans in the cellulose and cause little damage to those outside it, *Polystictus versicolor* produces an exactly opposite effect. The decay caused by *A. mellea*, though possessing the chemical characteristics of both brown and white rots, may reasonably be considered to belong predominantly to the latter type in view of its action on the alkali-solubility of the rotted residue.

S. hirsutum does not appear to exercise a selective action on lignin. The white patches or 'pockets' in wood attacked by this fungus merely represent areas in which decomposition has progressed to a greater extent than in the surrounding material. In these regions cellulose is decomposed as well as lignin, some of which still remains even after the development of the white appearance.

MOLL (F.). **Eine bemerkenswerte Zerstörung hölzerner Eisenbahnschwellen.** [A remarkable destruction of wooden railway sleepers.]—*Forstwissensch. Centralbl.*, liii, 21, p. 771, 1932.

A brief note is given on the destruction of beech wood railway sleepers on a south German line by a species of *Polystictus*, which produced a typical white rot, disorganizing the lignin and leaving the cellulose intact [cf. preceding abstract]. The sleepers were stated to have been impregnated with coal-tar oil, no trace of which, however, was to be found in the wood, and it is concluded that the treatment was very inadequately performed.

Dry-rot in timber.—*Dept. Sci. & Indus. Res., Rept. Building Res. Board for the year 1930*, p. 111, 1931.

A serious outbreak of dry rot [*Merulius lacrymans*] is reported in a large housing estate, situated on damp clay soil where drainage had been attended by considerable difficulty. The condition was attributed to the inadequacy of the sub-floor ventilation, the air bricks being too near the ground and having only about 3 sq. in. of unobstructed opening per brick. The timber plates

given a brush-applied coating of preservative had in some cases been destroyed by the fungus.

LABROUSSE (F.). **Observations sur quelques maladies des plantes maraîchères.** [Observations on some diseases of market-garden plants.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 8–9, pp. 286–289, 1931.

The wilt of spinach caused by *Pythium ultimum* [*R.A.M.*, x, p. 768 et seq.] was not found to attack plants sown after 15th September. Affected plants which were not killed off in the autumn were able to seed the following spring. Such plants (which showed the presence of *P. ultimum* in all their aerial organs) had a peculiar stunted and witches' broom like appearance. Both so-called 'summer' and 'winter' varieties of spinach are susceptible; tests with 48 varieties failed to show any appreciable resistance.

Eleven out of 167 types of chick pea (*Cicer arietinum*) showed definite resistance to anthracnose (*Ascochyta rabiei*) [ibid., xi, p. 150]; none of the Indian types tested was resistant. When two susceptible types and one resistant type were sown at intervals of 10 days from 1st April until 20th June, each retardation of the date of sowing increased the period between the emergence above the ground and the complete destruction of the susceptible plants (38 days for plants sown on 1st April, 67 days for those sown on 20th June).

A bacterial disease of beans [*Phaseolus vulgaris*] was reported from Croissy (Seine-et-Oise) on the Gloire de Vitry variety and from the vicinity of the Loire on Surpasse Empereur. On the leaves the lesions somewhat resembled those produced by *Colletotrichum lindemuthianum*, but the necrotic areas were ringed by a distinct yellowish-green halo and had an oily aspect very noticeable on young spots and on the under surface of the leaves. On the pods oily spots appeared, usually near the suture; during wet weather they rapidly spread and reduced the whole pod to a viscous mass. The disease was artificially reproduced by inoculation with an organism obtained from diseased material and provisionally identified with *Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, ix, p. 437; x, pp. 423, 434, 436]. Of 30 bean varieties inoculated, one, 'Nain abondant', remained unaffected; growers in the vicinity of Nozay (Seine-et-Oise) reported that this variety had remained healthy when Prodige de Courtry beans growing in identical conditions were severely infected.

PRASAD (H. H.). **A bacterial white soft rot of Turnip.**—*Indian Journ. Agric. Sci.*, i, 5, pp. 534–537, 1931.

In February, 1931, a number of well-grown turnips at Pusa were affected by a soft, white, malodorous root rot due to an organism closely resembling *Bacillus aroideae* or *B. melonis* [*R.A.M.*, x, pp. 125, 575], a technical description of which is given in English. Inoculation experiments through wounds on healthy, growing turnips resulted in the typical symptoms after about two days. The organism proved capable of rotting raw sterile turnips (from which it was re-isolated), sterile pieces of potato, sweet

potato, artichoke, beet, brinjal [*Solanum melongena*], radish, onion, carrot, cucumber, and musk melon. Corms of an ornamental plant belonging to the Amaryllidaceae were readily attacked, while cauliflower heads and stalks and cabbage stalks also proved susceptible.

WHITEHEAD (T.). **Dry-rot of Swedes. Second progress report.**—*Welsh Journ. of Agric.*, vi, pp. 289–295, 1930. [Received October, 1931.]

The investigation of the cause of the serious outbreaks of dry rot of swedes (*Phoma lingam*) which occur in North Wales [*R.A.M.*, viii, p. 691; x, p. 766] was continued by the author in 1929. All attempts to isolate the fungus from commercial samples of seeds were fruitless, and field tests with suspected seed also gave negative results.

In order to test the importance of rotting roots as a source of infection, seed was sown under oats in a field which had carried a badly infected crop of swedes the year before; six groups of infected seedlings were later located, an old root with dehiscing pycnidia being found with each diseased group. One isolated infected seedling was also found with no apparent source of infection in the vicinity. Subsequently, after the oats were cut, not only was there no evidence that the disease had spread, but it was no longer possible even to locate the originally infected seedlings.

The results of comparative experiments with swedes dressed with farm-yard manure and artificial fertilizers, respectively, indicated that contamination from the farm-yard manure was negligible.

In conclusion the author reviews the evidence regarding the seed transmission of *P. lingam* [ibid., ix, p. 218; cf. also viii, p. 752; ix, p. 151; x, pp. 327, 584, 766; xi, p. 95], quoting a verbal report by Buddin who found infection of one diseased seed per four or five thousand, and brings forward reasons for attaching importance to the exceedingly minute seed infection as a source of outbreaks.

SEAL (J. L.). **Diseases of winter Peas and Vetches caused by Mycosphaerella and Ascochyta.** [*ex* Botany and Plant Pathology.]—*Forty-second Ann. Rept. Alabama Agric. Exper. Stat. for the fiscal year ending June 30, 1931*, pp. 46–47 [? 1931].

The diseases of winter peas and of vetches [*Vicia* spp.] caused by *Mycosphaerella* [*pinodes*] and *Ascochyta* [*pinodella*: *R.A.M.*, xi, p. 150] were generally prevalent during the period under review. Although Oregon-grown seed showed barely a trace of disease compared with 8 per cent. on local-grown, the plants developing from both lots in adjoining areas were about equally infected in the late spring. A small amount of initial infection, therefore, may cause a high incidence of disease during the growing season. Forty different seed treatments were applied to local-grown peas without effect, but steam sterilization of field soil proved beneficial.

Cook (M. T.). **Powdery mildew disease of snap Beans.**—*Virginia Truck Exper. Stat. Bull.* 74, pp. 931–940, 2 figs., 1 graph, 1931.

Powdery mildew of snap beans [*Phaseolus vulgaris*] was first noticed by the author in Virginia early in September, 1930, and by the middle of October, the plants were so severely injured that it was evident that the yield would be reduced. The stems, petioles, and leaves were heavily coated with mildew, and many of the leaves had turned yellow and died. In addition, most of the pods picked from then on were so badly spotted and deformed as to be unmarketable. On the pods the spots are circular and may be mere specks or attain 5 mm. in diameter. Two or more spots frequently coalesce into large irregular lesions which may affect the entire pod. At first, only the white fungal growth is noticeable, but the spots soon turn yellowish- and then reddish-brown. The margins are indefinite and fringed. The fungus may entirely disappear from the older spots, which are often slightly sunken.

As perithecia were not found it was not possible definitely to identify the mildew with *Erysiphe polygoni* [*R.A.M.*, xi, p. 19].

In the autumn of 1930 the disease was most severe when the plants were making very poor growth owing to low temperature and insufficient soil moisture, conditions which a greenhouse test demonstrated to favour the disease. When the test plants were watered and the temperature was raised, they rapidly outgrew their former condition.

A survey of the fields in the autumn of 1930 indicated that whereas the Bountiful and Hodson Wax varieties are very susceptible, Refugee beans are quite resistant. Four control applications of a sulphur spray or dust are suggested, whilst it is also recommended that in sorting and grading the crop for market special care should be taken to remove any diseased pods.

Sardiña (J. R.). **Dos nuevas enfermedades de las Habas.** [Two new diseases of Broad Beans.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 59–80, 17 figs., 1931.

The morphological characters of *Botrytis fabae*, the causal organism of a decay of broad beans (*Vicia faba*) in Madrid, Seville, Cadiz, and other parts of Spain, have already been described [*R.A.M.*, ix, p. 424].

Under favourable conditions, the fungus may cause losses amounting to 80 or 100 per cent. of the crop. The first symptom of infection is the development on the leaves and stems of small iron-coloured to dark chestnut spots, surrounded by an orange to garnet-coloured halo. These lesions reach a diameter of 0·5 to 1 cm., at which stage the centre is tobacco-coloured and the surrounding portion consists of alternate pale and dark concentric furrows, with a livid halo. Finally, the lesions converge and the entire aerial part of the plant is killed. New shoots may be produced, but these in their turn are attacked and destroyed.

B. fabae was cultured on a number of standard media, full particulars of its growth on which are given. The optimum temperature for mycelial growth was found to be 30° C., and the

optimum hydrogen-ion concentrations for mycelial, conidial, and sclerotial development P_H 5·3, 7·3, and 4·5, respectively, in one strain of the fungus, and P_H 7·3, 7·7, and 3·9 in another. The results of inoculation experiments on broad beans indicated that a relative humidity of at least 84 or 85 per cent. is necessary to induce infection. None of the varieties of *V. faba* commonly cultivated proved immune from *B. fabae*, but a high degree of resistance was shown by the var. *minor* and 'green' beans, while the Granada and 'acid white' varieties were very susceptible. In inoculation tests the fungus was also pathogenic to French beans [*Phaseolus vulgaris*], peas, blue vetch [*V. cracca*], and lentils.

B. cinerea produces small, dull, dark chestnut to black spots on the leaves of *V. faba*, infection ultimately spreading to the lateral shoots and stems and causing the death of the plants. In the final stages the leaves are shrivelled and blackened or dark grey; hence the name 'grey rot' is proposed for this disease. The cultural characters of the fungus (which did not produce sclerotia) are described, the optimum temperature for mycelial growth being 29°. Inoculation experiments revealed a wide range of pathogenicity for the fungus, which proved capable of attacking the members of several other families.

Both *B. fabae* and *B. cinerea* may be controlled by cultural measures, including the destruction of infected material, supplemented by preventive applications of a standard fungicide, e.g., Bordeaux mixture.

BENLLOCH (M.) & DEL CAÑIZO (J.). **La 'rabia' de los Garbanzales.** [The anthracnose of Chickpeas.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 128–133, 7 figs., 1931.

A popular account is given of the symptoms and etiology of anthracnose of chickpeas (*Phyllosticta* [*Ascochyta*] *rabiei*) [see above, p. 344] in Spain, with recommendations for its control.

STOLZE (K. V.). **Beitrag zur Biologie, Epidemiologie und Bekämpfung der Blattfleckenkrankheit der Zuckerrübe (Cercospora beticola Sacc.).** [Contribution to the biology, epidemiology, and control of the leaf spot disease of Sugar Beet (*Cercospora beticola* Sacc.).]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 4, pp. 337–402, 8 figs., 16 graphs, 1931.

A comprehensive account is given of the writer's studies on various aspects of the leaf spot disease of sugar beets (*Cercospora beticola*) [*R.A.M.*, xi, p. 147] in Saxony.

No indication was obtained of specific or varietal immunity from leaf spot within the genus *Beta*. The minimum, optimum, and maximum temperatures for the growth of the fungus were found to be 5°, 25° to 30°, and 40° C., respectively. The mycelium is resistant to prolonged and severe frost, and between 60 and 100 per cent. the influence of the relative atmospheric humidity on its growth is approximately equal. Only a portion of the conidia withstood damp heat (40°), in which the viability of the sclerotial bodies is maintained up to 45° to 50°. Neither the conidia nor the

sclerotial bodies suffered any diminution of viability from exposure to dry heat at 50°.

Comparative experiments with diseased and healthy seed-clusters proved the transmissibility of infection through the seed. The artificial spread of the disease is readily effected both in the field and under glass by strewing dried, ground infected leaves over the plants. The incubation period ranges from 6 days at 21° to 50 at 15° and below, and prolonged incubation is considered to afford an explanation of the absence of symptoms on the young leaves. A wound periderm is formed round the necrotic tissues, and the anthocyanin ring (not a constant feature) may either develop simultaneously or a few days later.

Conidial formation is dependent on a high degree of atmospheric humidity as well as on relatively high temperatures, and the continuance of these conditions for one or two months is an essential for the development of an epidemic. The prediction of violent outbreaks of leaf spot would only be possible after a protracted study of the associated phenological data, and at the present juncture the disease does not constitute a constant menace to beet cultivation in Germany.

Some indications are given for the control of the disease by cultural measures. Breeding for immunity appears to offer little hope of success. The spread of infection may certainly be prevented by the treatment of the seed-clusters with a standard fungicide (betanal, germisan, uspulun, or sulphuric acid), but this expensive process is only justifiable where other purposes are also to be served. Experiments conducted from 1928 to 1930 showed that equally good results are given by spraying with 2 per cent. Bordeaux mixture [cf. ibid., x, p. 427], 1·5 per cent. nosperit, 1·5 per cent. nosprasit [ibid., x, p. 672], or 1·5 per cent. thionosperit, or by dusting with cusisa 1926 [ibid., x, pp. 703, 706], thionosperit, cupulvit [ibid., x, p. 582], and Nos. 1389, 1390, 1391, 1392, and 1393 (Meyer, Mainz). The best time for the application of the treatments was found to be from about 20th July to 20th August, the results being more satisfactory when they were carried out just before and during rainy periods than after heavy showers. In general, three applications at intervals of up to 20 days sufficed to hold the disease in check, but under German conditions the adoption of these methods is not considered to be profitable.

A four-page bibliography is appended.

Benlloch (M.). **Experiencias sobre la desinfección de semillas de Remolacha.** [Experiments on the disinfection of Beet seed.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 81–85, 1931.

The results [which are discussed and tabulated] of experiments in the control of leaf spot of sugar beets (*Cercospora beticola*) in three localities in Spain [*R.A.M.*, x. p. 427 and preceding abstract] indicated that no decisive increase of production or influence on the amount of infection in the crop was exerted by seed treatment with copper carbonate, uspulun, betanal, and abavit B, although these substances, especially the first-named, definitely augmented germinative capacity. On the other hand, spraying with Bordeaux

mixture (2 per cent.) or Burgundy mixture (1·18 per cent.) with the addition of calcium caseinate throughout the growing season resulted in considerably increased yields (20,400 and 19,200 kg. per hect., respectively, compared with a maximum of 15,549 kg. per hect. in the unsprayed plots sown with disinfected seed).

Weber (G. F.). **Blight of Carrots caused by Sclerotium rolfsii, with geographic distribution and host range of the fungus.** —*Phytopath.*, xxi, 12, pp. 1129–1140, 6 figs., 1931.

Carrots near Gainesville, Florida, were attacked in 1928 by *Sclerotium rolfsii*, which has apparently not hitherto been recorded on this host. The first symptom of infection is a general yellowing and flaccidity of the older leaves, which finally wilt completely and become prostrate, while the younger foliage also becomes rapidly involved. The roots lose their green or yellow colour and become brown and crisp, while the petioles are readily detached from the crown and may be scattered by the wind, leaving no trace of the plant above soil level. The fungus causes a wet rot of the roots. In advanced stages the central cylinder of the swollen root readily slipped out when the leaves were pulled, leaving the outer cylinder of cortex and phloem in the soil, where it was held by the mycelium. Finally, the decayed carrots dry out and shrink, leaving a cavity in the soil, the walls of such 'sand-wells' being securely held by the dried mycelium of the fungus. Sclerotia develop in profusion on the decaying carrot tissues in these cavities, being observed six inches below the soil.

The fungus was readily obtained in pure culture, and cross-inoculation experiments [the results of which are tabulated] were carried out with the carrot strain and those isolated from twelve other hosts, viz., bean [*Phaseolus vulgaris*], beet, cotton, cucumber, eggplant, lettuce, pea, pepper [*Capsicum annuum*], potato, squash [*Cucurbita* sp.], tomato, and watermelon, with positive results in all cases excluding the eggplant, lettuce, pea, and potato strains on pepper. A list of 189 host plants of *S. rolfsii* is given, including 68 newly recorded from Florida.

Porter (R. H.). **The reaction of Cucumbers to types of mosaic.** —*Iowa State Coll. Journ. of Sci.*, vi, 1, pp. 95–120, 4 pl., 1931.

Some of the information contained in this paper has already been noticed from another source [*R.A.M.*, ix, p. 427], but the following points are of interest. Cucumber virus 2 (formerly known as 'Bettendorf mosaic') was found to be highly pathogenic to seven varieties of watermelon, African and Green Seed citrons (*Citrullus vulgaris*), West India gherkin (*Cucumis anguria*), and Chinese Long cucumber. Stunting and mottling were common greenhouse symptoms which, however, were frequently outgrown by field plants. The incubation period of cucumber virus 2 is two to four days longer than that of 'white pickle' mosaic (cucumber virus 1) in White Spine plants. Stunting was less pronounced on this variety with the virus 2 type of mosaic than with white pickle, and in no case did it produce any symptoms on the fruits. Segregation for resistance and susceptibility to mosaic apparently occurred

in the F_2, F_3, and F_4 generations of crosses between Chinese Long and White Spine, and in the first generation from the back crosses. When the back cross of $F_1 \times$ Chinese Long was used, the segregates were more commonly resistant and tolerant plants.

HAENSELER (C. M.). **Control of seed decay and damping-off of Cucumbers.**—*Fifty-first Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1930*, pp. 254–264, 1930. [Received March, 1932.]

Heavy losses (up to 90 per cent. of the stand) are stated to occur annually in the cucumber fields and greenhouses of Atlantic County and elsewhere in New Jersey as a result of seed decay and damping-off due to *Pythium de Baryanum* [*R.A.M.*, x, p. 12] and *Rhizoctonia* spp.

The results [which are fully discussed and tabulated] of preliminary experiments in the control of these conditions in the Early Fortune variety showed that a number of copper carbonate and organic mercury dusts (e.g., semesan jr.) are effective for this purpose, especially when applied to seed previously moistened with a 4 per cent. glue solution (1 part of dust to 20 parts of seed). Seed treatment alone, however, is inadequate against severe attacks of damping-off, and should be supplemented by the application to the soil of 1 in 100 or 1 in 200 formalin at the rate of 100 to 200 c.c. per hill immediately after planting. The best protection was given where the formalin was combined with Bordeaux mixture at planting time, while very good results were also given by the application of Bordeaux mixture and copper-lime dust at germination, preceded by seed treatment.

KAWAMURA (E.). **New fungi on Sesamum indicum L.**—*Fungi (Nippon Fungological Soc.)*, i, 2, pp. 26–29, 4 figs., 1931.

Macrosporium sesami Kawamura, n. sp., found on sesame (*Sesamum indicum*) leaves in Fukuoka, Japan, is characterized by simple, erect, more or less flexuose, yellowish-brown, 1- to 5-celled conidiophores, arising singly or in fascicles, measuring 51 to 90 by 4 to 6 μ and each bearing a single conidium at the apex. The fusiform or obclavate, yellowish-brown to dark olivaceous conidia, 30 to 111 by 9 to 33 μ, have 3 to 13 transverse and a few longitudinal septa, at which they are slightly constricted, and terminate in a long, hyaline beak, 20 to 210 by 2 to 3 μ.

The 1- to 7-celled conidiophores of *Alternaria sesamicola* Kamamura, n. sp., on the same host [cf. *R.A.M.*, vii, p. 764], are similar to the foregoing and measure 30 to 90 by 3 to 5 μ. The obclavate, yellowish-brown conidia, produced singly or in chains at the tips of the conidiophores, measure 26 to 80 by 7 to 14 μ and have 2 to 10 transverse and a few longitudinal septa.

VERGE [G.] & RAVAZ [L.]. **La concentration de la sève et la résistance aux maladies.** [Sap concentration and disease resistance.]—*Rev. Gén. du Froid et Indus. Frig.*, xii, 2, p. 45, 1931.

In order to determine the possible relationship between sap con-

centration and reaction to fungous diseases in vine [*R.A.M.*, xi, p. 156], the writers determined the freezing points of the following varieties, viz., Rupestris du Lot −0·665° [C.], Riparia −0·74°, Cordifolia −0·74°, Lincecumii −8·72°, Aramon −0·735°, Grenache −0·78°, 7120 −8·685°, and 5813 −0·76°. These results are conflicting, the sap concentration of the susceptible vines not being consistently lower than that of the resistant ones. On the same vine stock, however, the concentration decreases regularly from the mature to the young leaves, viz., four basal leaves, −0·96°, four following −1·12°, next four −0·963°, next four −0·866°, and growing tip −0·765°. The mature leaves are immune from black rot [*Guignardia bidwellii*] and anthracnose [*Gloeosporium ampelophagum*], and comparatively resistant to mildew [*Plasmopara viticola*], so that there is an evident connexion between sap concentration and resistance in the same variety.

CHABROLIN (C.). **Le mildiou de la Vigne dans ses rapports avec la pluviométrie en Tunisie. Procédés de lutte.** [Vine mildew in its relations to rainfall in Tunis. Control precedure.]—Reprinted from *Bull. Direct. Gén. de l'Agric., Comm., et Colonis.* [Tunis], 22 pp., 1931.

The cultivation of the vine in Tunis extends over an area of some 40,000 hect., situated almost entirely at the base of Cap-Bon, between the town of Tunis in the north and Grombalia in the south, and receiving an annual rainfall of 400 to 500 mm. Mildew [*Plasmopara viticola*: *R.A.M.*, xi, p. 153] is present every year, but its practical importance is usually negligible, except occasionally, as in 1915 and 1921, when it caused heavy losses. An examination of the [tabulated] figures shows that in both these years there was copious rain during March to June with heavy showers at the end of March, which caused the oospores of *P. viticola* to germinate shortly after the buds emerged. The incubation period being approximately one week, it is calculated that in 1915 there were 11 successive waves of infection, while in 1921 not fewer than 9 occurred. The years in which infection was negligible were usually those in which rain was infrequent during spring and early summer. Other factors affecting any onset of the disease are prevailing temperature and, more especially, the sirocco, the latter suppressing an incipient attack of *P. viticola* more effectively than any control measure adopted.

While the first wave of infection appears to be of no practical importance, the second may destroy the young fruit clusters, and its onset should be prevented by making an application of copper sulphate mixture as soon as the young shoots are 10 to 15 cm. long. If heavy rain falls at this period, and especially if traces of mildew are noted, a second application should be made about a week after the first, before the fruit clusters are quite covered by the leaves. One or two early applications having been made, further treatment may be delayed until the disease definitely appears; under Tunisian conditions, one or two copper sulphate applications should be sufficient in two years out of three.

Black spot.—*Fruit World of Australasia*, xxxii, 9, p. 511, 1931.

To prevent outbreaks of black spot of the vine [*Gloeosporium ampelophagum*] under Australian conditions the author recommends swabbing the vines in winter or early spring with an acid iron solution consisting of 7 lb. strong commercial sulphuric acid (sp. gr. about 1·838) and 20 lb. iron sulphate in 10 galls. water, and following this with spray applications of neutral Burgundy mixture (7 : 10 : 50) or neutral Bordeaux mixture. When the buds are bursting alkaline Burgundy mixture (7 : 11 : 50, plus casein $5\frac{1}{2}$ oz. or resin soap $\frac{3}{4}$ lb.) or alkaline Bordeaux should be used, since acid and neutral mixtures are too easily washed off by rain.

United States Department of Agriculture Plant Quarantine and Control Administration. Service and Regulatory Announcements, July–September, 1931.—pp. 91–135, 1931.

The current plant quarantine regulations effective in Belgium and Sweden are briefly summarized on pp. 123–129 of this leaflet.

In connexion with the stem rust [*Puccinia graminis*] quarantine regulations [*R.A.M.*, xi, p. 80], lists are given [on pp. 92–93] of the species of *Berberis* and *Mahonia* immune from (1, i.e., *B. thunbergii* and its vars.), resistant (15), susceptible (75), and of unknown reaction (24) to this fungus.

British Honduras Proclamation No. 3 of 27th May, 1931 [p. 126], prohibits the importation, as from 1st June, 1931, of fruits (except green bananas, nuts, and dried or processed fruits), vegetables (except Irish potatoes, onions, canned or processed vegetables, grains, seeds, dried beans, and peas), and soil, earth, or other articles packed therewith, from any source other than the Dominion of Canada, the United Kingdom and Ireland, and the United States. Consignments of fruit and vegetables from these countries (except the last-named) must be accompanied by certificates stating that the products are home-grown.

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HANSFORD (C. G.). **Annual Report of the Mycologist.**—*Ann. Rept. Dept. of Agric. Uganda, for the year ended 31 December, 1930* (Part II), pp. 58–65, 2 graphs, 1931.

In this report [cf. *R.A.M.*, x, p. 297] the author states that during the 1929–30 season the internal boll disease of cotton caused by *Nematospora gossypii* [ibid., xi, p. 42] appeared to be of considerable importance in the Teso district of Uganda. In the district of Buganda a peculiar disease (known among the natives as 'kigabi') was common on cotton in 1930–1: the leaves on individual, apparently healthy plants suddenly wilted, developed brown spots between their main veins, and were shed, most of the plants affected being killed during the dry months of January and February. The wood of the diseased stems contained discoloured lines from which a species of *Fusarium* was isolated, the pathogenicity of which is, however, doubtful, since inoculations with it gave no positive results. There was no evidence of the spread of the disease from plant to plant in the field.

Among the other plant diseases recorded in 1930 in Uganda the following may be mentioned: *Gibberella saubinetii* causing a rot of maize cobs; *Cercospora sesami* on sesame [ibid., viii, p. 200]; *Helminthosporium leucostylum* causing a leaf blight of *Eleusine coracana* [ibid., x, p. 437]; *Alternaria solani* on potatoes; and *F. moniliforme* [*G. moniliformis*] causing a tip rot of banana fruits.

In the district of Toro the seeds inside apparently normal coffee berries were found to be shrivelled and discoloured, and to contain *Nematospora coryli*. This condition, which had not been previously reported locally, is stated to be identical with that described by Wallace from Tanganyika [ibid., x, p. 453]. The insect carrier (*Antestia* sp.) was very prevalent in Toro, and its suppression appears to be the only feasible means for the control of the disease.

In Appendix I [which is reprinted in the *Empire Cotton Growing Review*, ix, 1, pp. 21–31, 1932] to this Report, dealing with the black arm disease (*Bacterium malvacearum*) of cotton [*R.A.M.*, xi, p. 176] in Uganda, it is stated that during the 1928–9 season the disease was very severe in the northern and eastern parts of the Teso district; in the next season it caused a great loss of crop over the whole of the most important cotton-producing parts of the Eastern Province. For the 1930–1 season seed was imported from

comparatively disease-free areas, but in spite of this an appreciable amount of leaf infection was observed throughout the Teso district, in a few cases with stem infection also. During the fruiting stage of the crop the infection gradually died out, and a normal, comparatively clean crop was obtained.

Inoculations showed that spraying the cotton plants with *Bact. malvacearum* only produced the leaf spot form and that only under special environmental conditions, among which a high humidity is the most important. No infection on uninjured stems or branches, or on the boll surface was obtained under experimental conditions, but when the surface was damaged infection readily occurred on any aerial organ of the plant. Over 75 per cent. of the black arm lesions observed in the field had obviously started at the junction of the petiole with the stem, spreading downward through the cortex and phloem from infected leaves. The type of leaf spot most frequently followed by petiole infection is one more or less involving the main veins. The presence of the bacteria in the petioles is visible macroscopically, and gives a translucent appearance to the tissues. So far no evidence has been found in Uganda in support of Massey's theory of the systemic infection of the host by *Bact. malvacearum* [ibid., viii, p. 568], and all the indications are that under Uganda conditions seed infection is limited to the exterior of the seed.

Observations during the 1930–1 season indicated that plants growing on poor soil were very susceptible to the black arm form of the disease, the stems being often completely ringed and breaking off. On more robust plants on better quality soil the lesions formed during wet weather rapidly dried out on the return of drier conditions, and were cut off by cork layers. It was also shown that if the top of the subsoil is wet when the cotton seedling roots reach it, these can penetrate it, and a reasonable freedom of the crop from disease may be anticipated.

THOMPSON (A.). **Division of Mycology. Annual Report for 1930.** —*Dept. of Agric. Straits Settlements and Fed. Malay States Technical Reports for the year 1930, Bull.* 6, *Gen. Ser.*, pp. 65–75, 1931.

In addition to information already noticed from other sources [cf. *R.A.M.*, x, p. 309; xi, p. 105] this report contains the following items of phytopathological interest. *Marasmius palmivorus* [ibid., viii, p. 305] was very prevalent on oil palms [*Elaeis guineensis*] during the wet season, but the only injury caused was on ripe fruits, in which part of the pericarp was rotted. Eggplants were attacked by the fruit rot due to *Vermicularia capsici* and by a leaf disease due to a *Cercospora*, the former fungus also causing a tomato fruit rot. A wilt of zinnias was due to *Pythium aphanidermatum* [ibid., ix, p. 89].

MANNS (T. F.) & ADAMS (J. F.). **Department of Plant Pathology.** —*Ann. Rept. Delaware Agric. Exper. Stat. for the fiscal year ending June 30, 1931* (*Bull.* 172), pp. 42–51, 1931.

During the period under review attempts were made to transmit peach yellows and little peach [*R.A.M.*, x, p. 364] by the pollen, but

with negative results. Experiments to determine whether the absorption of copper salts by growing cucurbit plants imparted disease resistance were also unsuccessful as the solutions applied were too strong and killed the plants.

In spraying tests against bacterial spot of peach [*Bacterium pruni*: ibid., x, p. 225] the following preparations were used: mercutox (equivalent to 2 per cent. mercuric chloride), colatox (2 per cent.), sanoseed (6·3 per cent.), KIK (4 per cent.), and B.P.R. (2 per cent.), their lethal dilutions against *Bact. pruni* being determined as 1 in 25,000, 10,000, 100,000, 100,000 and 10,000, respectively, and the dilutions used in spraying being 1 in 1,600, 800, 2,000, 800, and 400, respectively. Applications were made during May and June, 1930, while in the preceding September and October sanoseed and B.P.R. had been applied, to compare the efficiency of post-harvest treatments. The first foliage infection was observed on 21st May, 1930, and the first twig infection on 7th June, by which date general foliage infection had also developed. Isolations from terminal twigs of Elberta peach trees in September, 1930, (A) from trees showing no infection, (B) from trees with heavy foliage infection, and (C) from trees with foliage and canker infection, gave negative results except from one bud in series C. Cankers collected at the same time also failed to yield the organism. No relation between infection by the oriental peach moth [*Cydia molesta*] and the overwintering of *Bact. pruni* was established.

Rotted strawberry roots consistently showed the presence of a species of *Actinomyces* [cf. ibid., xi, p. 250].

MARTIN (W. H.). **Plant pathology.**—*Fifty-first Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1930*, pp. 44–51, 235–254, 1930. [Received March, 1932.]

Further studies on the control of potato scab (*Actinomyces scabies*) and *Corticium* [*C. solani*: *R.A.M.*, x. p. 12] included the addition to fertilizers of mercurous chloride (calomel) and certain organic mercury compounds. The best result in the elimination of *A. scabies* was given by the use of 15 lb. mercurous chloride per acre, which yielded 91·2 per cent. clean tubers, compared with 46·7 per cent. on the plots receiving fertilizer alone. On the latter plots only 1·5 per cent. of the tubers were free from the sclerotia of *C. solani*, compared with 48 per cent. on those treated with mercurous chloride.

Out of 650 tomato seeds from plants infected by wilts (*Fusarium lycopersici* and *Verticillium* [*albo-atrum*]) and 450 with early blight (*Alternaria solani*), not a single one was found to carry the organism internally. Negative results were also given by cultures of 1,500 seeds from lots originating in diseased fields. Good control of bacterial canker of tomatoes (*Bacterium vesicatorium*) [ibid., x, p. 73] was given by immersion of the seed in water for one hour at 50° C., 30 minutes at 55°, or 15 at 60°.

For severe attacks of apple fruit spot (*Phoma* [*Mycosphaerella*] *pomi*) [ibid., x, p. 391] at least three applications of Bordeaux mixture (2–6–50 or 1–3–50) are necessary, 17 days, 4 weeks, and

10 weeks after petal fall. Copper-lime dusts are also effective as fungicides, but they caused burning of the fruit and foliage.

Phomopsis vexans, the cause of a fruit rot of eggplants [ibid., viii, p. 23], was found to be borne under the seed coats of seeds from badly decayed fruits. The organism was destroyed by 15 minutes' immersion of the seed in water at 55° or 30 minutes at 50°. Beet leaf spots (*Phoma betae* and *Cercospora betae*) were also well controlled by 30 minutes' immersion of the seed in water at 55°, which resulted in a yield of 118 bushels compared with 87 for an untreated section of a greenhouse.

Pepper [*Capsicum annuum*] seed selected from healthy, mosaic [ibid., xi, p. 226], and leaf rolled plants, respectively, was tested under field conditions for seed transmission of these diseases. A test of 216 plants from six healthy parents yielded 3·2 per cent. mosaic, compared with 25·4 per cent. for 264 plants from seven diseased parents. The progeny from two of the mosaic parents gave 60·4 and 72·2 per cent. disease, whereas 8·3 per cent. mosaic was the highest in any of the 'healthy' selections. A comparison of 180 plants each from five healthy and five leaf roll parents indicated that this condition is also seed-transmitted and at least partially controllable by careful selection of parent stock.

The immersion of gladiolus corms in mercuric chloride 1 in 1,000 plus 1 per cent. HCl for seven hours against the seed-borne diseases caused by *Septoria gladioli*, *Bacterium marginatum*, and *Fusarium oxysporum* [var.] *gladioli* gave 76·6 per cent. clean corms in three tests on three varieties, compared with 27·2 per cent. in the controls. This treatment, however, resulted in delayed germination and sometimes in the formation of brown, sunken areas on the corms. No injury followed the use of six ethyl mercury chloride compounds, which resulted in averages of 70·4 and 81 per cent. clean corms in two experiments, compared with 21·7 and 41·8 per cent. in the untreated checks.

Inoculation experiments on a number of species of *Rhododendron* showed that all were susceptible to three strains of *Phytophthora cinnamomi*, viz., the type strain from cinnamon, an isolation from *Persea* sp. in Porto Rico, and the New Jersey rhododendron strain [ibid., x, p. 12].

Botany.—*Forty-third Ann. Rept. Georgia Exper. Stat. for the year 1930*, pp. 27–29, 1930. [Received April, 1932.]

In connexion with the work of selection for resistance to tomato wilt (*Fusarium lycopersici*), which has now been in progress in Georgia for ten years [*R.A.M.*, x, p. 436], it is stated that no strains of the Globe variety are immune from the disease, nor do they appear to be increasing in resistance.

Negative results in the transmission of peach rosette were given by the injection of juice or the insertion of crushed leaves and twigs from diseased into healthy trees, as well as by rubbing the leaves and growing points of healthy trees with crushed leaves and twigs of infected ones. However, fragments of bark from rosetted trees grafted on to healthy ones were fully as effective as buds in the transmission of the disease [ibid., x, p. 601].

Report of the Alaska Agricultural Experiment Stations 1930. —48 pp., 12 figs., 1 graph, 1931.

The following items of phytopathological interest occur in this report. In an experiment made at the Sitka Station to determine the value of lime in the control of finger-and-toe of cabbage (*Plasmodiophora brassicae*), the application of 1 or 2 tons per acre failed to cause an appreciable improvement, but the disease was partially arrested by 4 tons per acre. Cauliflowers were an almost complete failure on account of this disease.

Potatoes at the Matanuska Station developed black heart [*R.A.M.*, ix, p. 669] in the propagating-houses; the White Bliss variety appears to be resistant to this disease.

Brown (Nellie A.) & Leonard (L. T.). **Is Bacterium tumefaciens a mutant or one of the pleomorphic forms of Bacillus radiobacter ?**—Abs. in *Phytopath.*, xxii, 1, p. 5, 1932.

The possibility that *Bacterium tumefaciens* may be a mutant, a physiologic form, or a pleomorphic form of *Bacillus radiobacter* has been suggested by the frequent appearance of non-virulent colonies of *Bact. tumefaciens* on plates made from known crown gall tissue, various cultural resemblances between the two organisms, and the development of tumour-like excrescences on various hosts from which *B. radiobacter* was isolated and not *Bact. tumefaciens*, more especially the appearance of galls $\frac{3}{4}$ to 1 cm. across in less than a fortnight on uninoculated cut stems of cowpea kept in a moist chamber.

B. radiobacter was isolated from these cowpea tumours and inoculated into the same and other plants with negative results, except in the case of one strain which produced small tumours, 5 to 6 mm. across, on daisy [*Chrysanthemum frutescens*] stems.

Stapp (C.) & Bortels (H.). **Der Pflanzenkrebs und sein Erreger, Pseudomonas tumefaciens. II. Mitteilung : über den Lebenskreislauf von Pseudomonas tumefaciens.** [Crown gall of plants and its causal organism, *Pseudomonas tumefaciens*. Note II: on the life-cycle of *Pseudomonas tumefaciens*.]—*Zeitschr. für Parasitenkunde*, iv, 1, pp. 101–125, 23 figs., 1 diag., 1931.

A detailed account is given of the authors' investigations on the different phases in the life-cycle of *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, x, p. 778], with special reference to the formation and disintegration of 'bacterial stars'. This phenomenon can be observed in cultures on dilute carrot juice with the addition of iron and manganese salts (preferably in the form of 0·01 per cent. $FeSO_4.7H_2O$ and 0·01 per cent. of $MnSO_4.7H_2O$). The cohesion of the bacteria in 'stars' is effected by protoplasmic connexions between the single individuals, the 'stars' during this phase being embedded in a tough, ropy mucilage. The protoplasmic connexion can be readily seen after treatment with KOH and staining with methylene blue.

'Star' formation is thought to be in all probability a sexual process. The individual rods resume division after the 'stars' break up and the young forms resume motility.

No filterable stages of *Bact. tumefaciens* could be detected in the course of these studies.

RIVES (L.). **Sur le cancer végétal et le potassium.** [On crown gall of plants and potassium.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 2, pp. 63–67, 1 fig., 1932.

In connexion with a current medical theory to the effect that predisposition to cancer in man is accentuated by a high potassium content of the tissues, the writer undertook a series of tests to determine the action (if any) of this mineral on the development of crown gall (*Bacterium tumefaciens*) in geraniums. Contrary to expectation, the plants receiving no potassium developed much the largest and most luxuriant tumours. This is tentatively attributed to the existence of a radio-physiological antagonism between potassium and *Bact. tumefaciens*, analogous to that between the salts of potassium and those of radium. Experiments (in collaboration with Dr. Olga Miletsky) at Toulouse also showed that the addition of potassium chloride (3 gm. per plant) does not favour the development of *Bact. tumefaciens*, whereas exceptional dimensions were reached by the tumours on plants receiving quicklime.

GASSNER (G.). **Neue Feststellungen über Auftreten und Verbreitung der Getreiderostarten in Südamerika.** [New facts concerning the occurrence and distribution of the cereal rust species in South America.]—*Phytopath. Zeitschr.*, iv, 2, pp. 189–203, 1 map, 1931.

During the author's travels in South America from September to December, 1927, the following observations on cereal rusts were made. *Puccinia graminis* was found on wheat at Campinas and elsewhere in San Paulo, Brazil, this being its northernmost record for South America. Rye was attacked by *P. dispersa* [*P. secalina*] and oats by *P. coronifera* [*P. lolii*]. In Paraguay wheat was infected by *P. graminis* and *P. triticina*, both the uredo and teleuto stages being observed, oats by *P. lolii* (mostly uredospores), and rye by *P. secalina*. Conditions were similar in Misiones [north-eastern Argentina]. Wheat in Uruguay was attacked by *P. graminis* and *P. triticina*, the former occurring also on barley and oats, the latter of which also showed constant infection by *P. lolii*. Rye was extensively infected by *P. secalina*. Both *P. graminis* and *P. triticina* were widespread in the northern wheat belt of Argentina [*R.A.M.*, x, p. 88], the former also attacking oats and a few scattered barley plants. Rye was infected by *P. secalina*. About 300 km. south of Buenos Aires there was a marked decline in the incidence of *P. graminis* and *P. lolii*, but not in that of *P. triticina* or *P. secalina*. Still further south (600 to 650 km. from Buenos Aires) only a trace of *P. graminis* was detected on the Record and Ideal wheat varieties, while *P. triticina* was not severe except on Kanred. South of Bahia Blanca, where the cultivation of cereals is limited by climatic factors, *P. triticina* was found to a moderate extent on wheat and *P. secalina* on rye. In south-east Brazil (near Porto Alegre) wheat was infected with extreme severity by *P. graminis*, which also caused heavy damage to oats and barley. Wheat, oats,

and rye in this area further showed extensive infection by *P. triticina*, *P. lolii*, and *P. secalina*, respectively.

P. glumarum was not observed by the writer on the occasion of his visit to South America, and it is evident, therefore, that its introduction into Argentina [ibid., x, p. 509; cf. also xi, p. 226] dates from between 1927 and 1929, probably 1928. The rust may possibly have been conveyed in the form of spores adhering to the the seed-grain, or it may have advanced inland from Chile (where it is reported to have been observed by Holway in 1919), crossing the mountain range of the Cordilleras.

Dodoff (D. N.). Устойчивость на нѣкои наши и чужди Пшеници спрямо седемь физиологически раси на **Puccinia triticina Erikss.** [Resistance of some Bulgarian and foreign Wheat varieties to seven physiological forms of *Puccinia triticina* Erikss.]—*Renseignements Agricoles*, Sofia, xii, 11–12, pp. 1–64, 10 figs., 1931. [English summary.]

This is a detailed account of the author's tests in the spring of 1931 of 192 varieties of wheat (including representatives of the five main groups of *Triticum*) of Bulgarian and foreign origin for resistance to the seven physiological forms of *Puccinia triticina* recently described from Bulgaria [*R.A.M.*, xi, p. 33]. The results [which are presented in tabular form] showed that the greatest resistance to all the 7 forms was exhibited by the einkorn (*T. monococcum*) group. The varieties of the emmer group (*T. dicoccum*) were characterized by the heterogeneous type of infection (type x) [ibid., ii, p. 159], the different parts of the same leaf showing various degrees of resistance. Resistance in these two groups of wheat was very uniform but not specific. The reaction of the durum wheats varied from high resistance in some varieties to high susceptibility in others, the resistance to the various physiological forms of *P. triticina* in most cases being very uniform. It was shown, however, that the varieties of this group vary widely in their reaction to infection, presumably in response to the influence of environmental factors, among which temperature is probably the most important; some varieties exhibited a higher degree of resistance in May than in March. In the *vulgare* group resistant varieties were very few: all the commercially valuable varieties proved to be very susceptible to all the seven physiological forms of rust. In the few cases where it was found, resistance was strictly specific and confined to some only of the forms.

The work also indicated that the seven Bulgarian physiological forms of *P. triticina* may be divided, on the ground of the reactions caused by them in the wheats studied, into two main groups, the first of which is represented by form XV and the second comprises forms XIII or XX and XXI. The pathogenicity of the forms of the second group was almost similar on all the wheat varieties and only differed on the variety Brevit C.I. 3778, the differences being noticeable only under certain environmental conditions. Form XXIV occupies a place intermediate between forms XIII or XX and form XXI, and forms XVII and XIX are intermediate between the two main groups, XVII being nearer XV and XIX nearer XIII (XX).

Aamodt (O. S.). **Varietal trials, physiologic specialization, and breeding spring Wheats for resistance to Tilletia tritici and T. levis.**—*Canadian Journ. of Res.*, v, 5, pp. 501–528, 13 graphs, 1931.

The investigation reported in detail in this paper was undertaken in the attempt to elicit the causes of the considerable increase, noticed of recent years, in the amount of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: *R.A.M.*, xi, p. 289] in western Canada, and also the possibility of controlling the disease by breeding resistant varieties of wheat. Varietal resistance tests of 149 varieties and selections of red spring wheats (*Triticum vulgare*) indicated that the increase in bunt may be accounted for in part by the introduction into western Canada of certain varieties, such as Kota, Ceres, Progress, Reward, and Red Bobs 222, that are more susceptible to bunt than some of the older varieties, e.g. Marquis. The tests also showed that the spring common wheats exhibit all gradations in reaction to bunt from apparent immunity to high susceptibility, and that, as a class, they are more susceptible to *T. foetens* and less susceptible to *T. caries* than the durum wheats; several new varieties, however, such as Kota, Ceres and Progress, are highly susceptible to both species of bunt. A number of varieties commonly grown in western Canada, such as Garnet and Ruby, are fairly resistant, but not sufficiently so as to render seed treatment unnecessary.

The inoculum used in the tests consisted of composite collections of smut spores grown on a number of wheat varieties, the indications being that this method is sufficiently reliable in determining the reaction of a variety to bunt. There was clear evidence of the existence of physiologic forms of the two species, the term physiologic form being used to design a spore collection purified by growth during two or three generations on pure host material, and capable of producing a definite set of reactions on a given group of differential varieties [a list of which is given]. In the course of the work one physiologic form of *T. caries* and five of *T. foetens* were obtained from six collections, but it is believed that a considerable number of forms could probably be distinguished with numerous collections and the proper differential hosts. Some of these physiologic forms appeared to vary in their infection capabilities at different temperatures.

The preliminary study of inheritance of resistance to bunt in the F_3 generation of crosses between parents of varying resistance or susceptibility showed that the average percentage infection of the F_3 lines was intermediate between that of the two parents in eight out of nine crosses; in the ninth cross the average percentage was greater in the F_3 line than in either of the parents. The reaction to wheat bunt appears to be governed by multiple factors, the exact nature of which has not yet been determined.

Reichert (I.). **Tilletia tritici on Aegilops.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 133–135, 1931.

The author states that of 19 species of *Aegilops* tested in his artificial inoculation experiments with *Tilletia tritici* [*T. caries*]

from wheat in Palestine [*R.A.M.*, xi, p. 34], only one (*A. ventricosa*) was successfully infected with the spores of the smut.

Foëx (E.) & Rosella (E.). **Au sujet du problème du piétin du Blé.** [On the problem of the foot rot of Wheat.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 294–302, 1 pl., 1931.

In continuation of their studies of the problem presented by the foot rot diseases of wheat in France [*R.A.M.*, x, p. 720], the authors give a brief description of the characters differentiating *Leptosphaeria herpotrichoides* from *Cercosporella herpotrichoides*, since these two organisms appear frequently to have been confused.

Moritz (O.). **Entstehungsbedingungen und Verhütungsmöglichkeiten der Ophiobolose des Weizens. Vorläufige Mitteilung.** [Conditions of origin and possibilities of prevention of ophiobolosis of wheat. Preliminary note.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 12, pp. 100–101, 1931.

Pursuing his studies on the factors governing the development of foot rot of wheat (*Ophiobolus*) [*graminis*] in Schleswig-Holstein [*R.A.M.*, x, p. 512], the writer observed a distinct connexion between the occurrence of the disease and the geological age of the soil. Foot rot is found only on the oldest podsol soils of the eastern and central districts, while the geologically recent western marshes and the island of Fehmarn (czernosen or black soils) are exempt from the disease. The physical structure of the soil is probably in part responsible for the presence or absence of foot rot, which was completely suppressed in recent pot experiments by kaolin, and also by the addition of charcoal to a peat and sand soil. Experiments on the lines of those conducted by Sanford and Broadfoot [ibid., x, p. 719] showed that the pathogenicity of *O. graminis* was greatly reduced by the admixture of non-sterile soil from any locality, especially from the uninfected districts, whereas sterile soil showed no such action. The non-sterile eastern soils and that from a field in which foot rot occurred in the previous summer also failed to cause any appreciable reduction in the virulence of the fungus. The biological condition of the soil is evidently of paramount importance in the etiology of foot rot, the association of which with chemical and physical factors requires further investigation.

Schmidt (E.) & Tornow (E[lisabeth]). **Nachweis der Beizung von Getreide mit Quecksilber und anderen Metallgiften.** [Demonstration of the disinfection of cereals with mercury and other metallic poisons.]—*Fortschr. der Landw.*, vii, 2, pp. 40–42, 1932.

Full details are given of an electrolytic apparatus, supplied by Dr. Bender and Dr. Hobeim, Lindwurmstr., Munich, for the detection of mercury and other heavy metals in treated cereal seed-grain. Tests with this on rye and wheat seed-grain treated with uspulun-universal and germisan in 1927 showed that the mercury does not gradually disappear by volatilization as is often assumed.

Welsh (J. N.). **The inheritance of stem rust and smut reaction and lemma colour in Oats.**—*Scient. Agric.*, xii, 4, pp. 209–242, 1931.

This is a detailed account of the investigation at the Dominion Rust Research Laboratory, Winnipeg, of the inheritance of varietal resistance in oats to stem rust (*Puccinia graminis avenae*) [*R.A.M.*, x, pp. 176, 177], and to loose smut (*Ustilago avenae*) and covered smut (*U. levis*) [*U. kolleri*: cf. ibid., xi, p. 233]. In Canada the problem of breeding for resistance to all physiological forms of the rust is complicated by the existence there of form 6, to which all the oat varieties tested are susceptible; since, however, this form and the recently isolated virulent form 8 are comparatively rare under field conditions, and sufficient varietal resistance was found to all the other forms, it is considered that success may ultimately be attained on a field scale. Varietal reaction to the rust seems to be governed by a single factor, resistance being apparently dominant; the only exception was found in the reaction of the cross Heigira Strain with Joanette Strain to form 4, which appeared to be governed by two factors. No relationship was found to exist between reaction to the rust and such characters as maturity of the host and colour of the lemma.

The work indicated that oat strains resistant to both types of smut can be produced without much difficulty. A fairly high correlation was established between the amount of infection that developed in oat lines inoculated with both smuts, and transgressive segregation was observed in such lines. It was also shown that plants infected with the smuts are more susceptible to rust infection than non-smutted ones.

Coffman (F. A.), Stanton (T. R.), Bayles (B. B.), Wiebe (G. A.), Smith (R. W.), & Tapke (V. F.). **Inheritance of resistance in Oats to Ustilago levis.**—*Journ. Agric. Res.*, xliii, 12, pp. 1085–1099, 1931.

This is a summarized report of the authors' study since 1925 of the inheritance of resistance to covered oat smut (*Ustilago levis*) [*U. kolleri*] in crosses between the highly resistant, if not entirely immune, oat variety Markton [*R.A.M.*, x, pp. 178, 721] and nine susceptible varieties [a list of which is given]. In the F_2 populations of seven of these crosses susceptible and heterozygous plants were predominant, while in the remaining two, in which the populations grown were small, the reverse was true. In three crosses approximately one-fourth of the progeny lines from F_2 individuals were free from smut, and in three other crosses the smut-free and infected progeny lines were almost equally divided. In the F_3 lines the gradation in the percentage of smut-infected plants was such as to preclude the classification of these progenies into genetic classes on this basis. Especially high correlation between infection percentages in the F_3 and F_4 was found in the crosses of Markton with Scottish Chief, and there was also evidence of such a correlation in three other crosses. Transgressive segregation for susceptibility was found in some of the F_4 progenies of the crosses with Markton as one parent and Scottish Chief or Swedish Select as the other. Little or no correlation was established between the mor-

phological characters of the oat varieties and relative resistance of their progeny to the smut.

The results of the work appear to disprove the existence in Markton of three factors for resistance to all the physiological strains of *U. kolleri.*

HUSKINS (C. L.). **Blindness or blast of Oats.**—*Scient. Agric.*, xii, 4, pp. 191–199, 1931.

The results of the author's biometrical study of blindness or blast [*R.A.M.*, viii, p. 303] in oats in Canada [details of which are given] lead him to consider that this condition is due to several different causes. There was an indication that good blast-resistant varieties of oats may be produced by breeding.

LUNDEGÅRDH (H.). **Studier over stråsädens näringsupptagande samt dettas betydelse för tillväxten och för uppkomsten av icke-parasitära sjukdomar.** [Studies on the nutrient absorption of cereal seed-grain, its importance for growth and for the development of non-parasitic diseases.]—*Centralanst. för försöksväsendet på jordbruksområdet Meddel.* 403, 146 pp., 4 figs., 29 graphs, 1931. [English summary.]

An exhaustive account, accompanied by 55 tables, is given of the author's studies, conducted in Sweden by spectroscopic methods, of the intake and distribution of cations in water and pot cultures chiefly of Seger, Dala, and Mesdag oats.

All factors causing a decrease in the manganese absorption of the plant, e.g., large quantities of lime, humus, or colloids, and the application of nitrate or alkaline phosphate fertilizers, were found to promote the occurrence of grey speck [*R.A.M.*, xi, p. 295]. The hydrogen-ion concentration is important, since it determines the availability of the manganese in the soil. In addition to manganese deficiency, a disturbed ion balance in the plant, especially extremely low or high values of the quotient potassium : calcium phosphate, appears to be a decisive factor in the development of grey speck.

CHRISTENSEN (J. J.). **Studies on the genetics of Ustilago zeae.** —*Phytopath. Zeitschr.*, iv, 2, pp. 129–188, 2 pl., 1931.

A very comprehensive and fully tabulated account is given of the author's continued researches on the genetics of maize smut (*Ustilago zeae*) [*R.A.M.*, ix, p. 713].

The fungus is predominantly heterothallic, but some monosporidial lines were found to be pathogenic when inoculated singly into maize plants. Segregation of the factors for sex, growth rate, and other cultural characters in the smut spores produced by these solo-pathogenic lines occurs in the promycelium, so that the sporidia are evidently bisexual. All solo-pathogenic lines are heterozygous for sex, but some are homozygous and others heterozygous for other characters. Nine different types of sexual grouping were obtained from individual chlamydospores [smut spores], the factors for cultural characters segregating independently of sex and of one another.

The solo-pathogenic lines resemble the unisexual lines in the

following characters: sporidial size and shape, colour range, growth rate, consistency of colonies, and tendency to sector, as well as in the microscopic details of the mycelium in culture. Solo-pathogenic lines are equally stable with unisexual ones; they do not lose their cultural peculiarities by passage through a living host, or their pathogenicity when reisolated from mycelium in the living host before spore formation. Such reisolations were made by infecting a leaf, removing the infected part after four to six days, surface disinfection, and incubating in a moist chamber, when aerial sporidia developed from the mycelium in the leaf. Solo-pathogenic lines, in fact, are distinguishable from unisexual ones only by inoculation tests. When the former are inoculated singly into maize, they develop a parasitic mycelium, produce anthocyan pigment, and form smut spores like two compatible unisexual lines. The mycelium of the solo-pathogenic and unisexual lines is often very irregular, contorted, and may be either uni- or multinucleate. Mature smut spores produced by solo-pathogenic monosporidial lines are of the same general shape and size as those formed by two unisexual lines of opposite sex, and they germinate normally.

KOVAČEVSKI (I. C.). Бактериалниятъ листенъ пригоръ по Суданката и Метлата. [The bacterial leaf blight of Sudan Grass and Broomcorn.]—*Земледѣлска Мисъль* [*Agricultural Thought*], Sofia, ii, 3, pp. 51-64, 1 pl., 1931. [English summary.]

Sudan grass (*Andropogon sorghum* var. *sudanensis*), a recently introduced forage crop in Bulgaria, is stated to be severely affected over the whole country by a bacterial leaf spot [the symptoms of which are described] caused by an organism which is provisionally identified as *Bacterium holci* [*R.A.M.*, x, p. 238] in spite of a few minor differences, such as the frequent occurrence in the Bulgarian form of bipolar flagella and the fact that it coagulates milk before clearing it and does not reduce nitrates. The disease was also observed in nature on broomcorn (*A. sorghum* var. *technicus*), on which it is of no economic importance, and on Johnson grass (*A. halepensis*), a common and noxious weed in Bulgaria. The organism was experimentally shown to be pathogenic to dent and flint maize, but was not found on these hosts in nature. Preliminary experiments showed that the disease was not controlled by dipping the Sudan grass seed in 1 in 300 formaldehyde solution for 60 minutes, or by dusting it with granosan or semesan.

Although this is apparently the first record of *Bact. holci* in Europe, the author states that he found this organism in Bulgarian herbarium material of broomcorn dating from 1907. He also believes that careful study will show that the bacterial leaf spots of sorghum and Sudan grass described from south Russia, Italy, and Hungary and attributed to *Bacillus sorghi* [ibid., v, p. 741; viii, p. 753] are really caused by *Bact. holci*.

RHOADS (A. S.) & DE BUSK (E. F.). **Diseases of Citrus in Florida.** —*Florida Agric. Exper. Stat. Bull.* 229, 213 pp., 101 figs., 1931.

In this paper (a revision of Bulletin 150, 1918) descriptions are given of a number of fungous, bacterial, and physiological diseases

of citrus in Florida, with observations on their prevention by cultural measures and on the preparation and application of Bordeaux mixture, Bordeaux-oil emulsion, and lime-sulphur. Gummosis in Florida [*R.A.M.*, x, p. 727] is stated to be due to a number of causes, but the term is usually applied to a characteristic severe and often chronic disease on large bearing trees, the cause of which is unknown. Psorosis in Florida is considered to be undoubtedly due to an organism, but the latter is unknown. Florida scaly bark, termed leprosis by Fawcett and Lee [ibid., v, p. 735], is distinct from psorosis and is also found in Mexico, southern China, and the Philippines but has not been reported elsewhere. On the fruit this disease, the cause of which is unknown, is termed nail-head rust. It is confined almost exclusively to the sweet orange, whereas psorosis affects grapefruit and tangerines in addition. Fly speck due to *Leptothyrium pomi* is only occasionally found on citrus fruits in Florida, sometimes accompanied by sooty blotch due to *Gloeodes pomigena* [ibid., xi, p. 105].

RHOADS (A. S.). **Clitocybe mushroom root rot—a new disease of Citrus trees.**—Abs. in *Phytopath.*, xxii, 1, p. 23, 1932.

Some 150 citrus trees in Florida, including grapefruit, orange, and tangerine [*Citrus nobilis* var. *deliciosa*] on rough lemon rootstock, have been found suffering from an apparently long-standing root rot caused by *Clitocybe tabescens* [*R.A.M.*, x, p. 99].

BRIEN (R. M.). **Dormancy period of the Citrus bark-blotch organism.**—*New Zealand Journ. of Agric.*, xliii, 6, p. 421, 1931.

Continued observations since the publication of the author's recent paper on the pathogenicity of the bark-blotch fungus (*Ascochyta corticola*) of lemon trees in New Zealand [*R.A.M.*, x, p. 727] have shown that the organism may remain dormant for eleven to fifteen months after inoculation; on the onset of favourable conditions it is then capable of breaking out in a severe form, as exemplified on two trees of the Lisbon variety. This fact indicates that growers should continue to examine all the cankers treated at intervals over a period of at least 18 months, in order to ensure the success of the treatment.

SMITH (F. E. V.). **Stem end rot of Citrus fruits.**—*Journ. Jamaica Agric. Soc.*, xxv, 12, pp. 543–545, 1931.

After stating that investigations are in progress in Jamaica into the stem-end rot of citrus caused by *Diplodia natalensis* [*R.A.M.*, ix, p. 777] associated with a *Phomopsis*, and briefly describing in popular terms the manner and conditions in which infection occurs, the author emphasizes that the disease results directly from unsatisfactory cultural conditions in the citrus orchards. Care must constantly be taken to cut out and burn all the dead wood in order to eliminate as far as possible the main source of natural infection; the fruit should be picked in dry weather, not unduly wetted for a prolonged period after picking, and should be stored in a dry atmosphere.

After much experience of examining fruit in Jamaica in 1931 and

after inspecting for more than three months in 1929 samples entering Covent Garden from the island, the author concludes that the chief causes of loss in exported Jamaica citrus fruit are stem-end rot and blue-green mould [*Penicillium digitatum*].

TOMKINS (R. G.) & TROUT (S. A.). **The use of ammonia and ammonium salts for the prevention of green mould in Citrus.** —*Journ. Pomol. and Hort. Science*, ix, 4, pp. 257–264, 1931.

The experiments briefly described in this paper consisted in keeping oranges that had been inoculated through wounds with the green mould fungus (*Penicillium digitatum*) [*R.A.M.*, xi, p. 104] for periods from 7 to 73 days in large glass desiccators in the presence of various concentrations of ammonia in the air. At a temperature of 18° C. wastage due to the mould was considerably reduced by two and five parts of ammonia per 10,000, without impairing either the appearance or the flavour of the fruit; 10 parts per 10,000 caused slight damage to the skin of some fruit, while 20 parts did considerable damage in 15 days. The presence of ammonia in the air appeared, however, to favour the development of *Colletotrichum* [? *gloeosporioides*] spots after 21 days. At lower temperatures (3° and 10° C.) the green mould was almost completely controlled by one part ammonia per 10,000, but the fruit was less tolerant of the substance, since 3 parts caused damage to the skin immediately around the wounds, and in the presence of 10 to 12 parts the damage to the skin was general.

Comparable results were also obtained when ammonium bicarbonate was used instead of ammonia, or when a crystal of ammonium bicarbonate was enclosed in the wrappers around the oranges in a humid atmosphere; in dry air, however, the last method failed to give control. Subsidiary experiments indicated that ammonia may also be effective in the control of storage rots of grapes, but not of strawberries or raspberries.

HEWITT (J. L.). **Scaly bark. I. Favoured by soil and water conditions. II. Varies with seasons and groves and is controllable.**—*California Citrograph*, xvi, 12, pp. 547, 582–583; xvii, 1, pp. 17, 19, 32, 7 charts, 1931.

Data obtained in recent years from practical field experience in Orange County, California, lead to the following tentative conclusions concerning the incidence of psorosis of orange trees [see preceding page]. The heavier the soil the more it favours liability to the disease; excessive watering increases liability, though the water relation of psorosis is different from that of *Phytophthora* gummosis [*P. citrophthora*] or that of the so-called 'water injury' due to root rots; the condition is related to some atmospheric condition, probably moisture; and liability to infection varies annually. Following their inception, psorosis lesions become noticeable in from less than a year to about eighteen months. The Valencia orange is more susceptible than Navels, tangerines and grapefruit less so. Trees top-worked with limbs of one variety on a trunk of another variety or species are highly susceptible. Trees usually become liable to infection at 6 or 8 years of age, this liability increasing up to 15 or 20 years, and then decreasing. It is thought that the

disease may possibly have been recently introduced into Orange County.

HEWITT (J. L.). **Scaly bark treatment.**—*California Citrograph*, xvii, 2, pp. 54, 70, 1 fig., 1931.

The author considers that under the conditions prevailing in commercial groves in Orange County, California, the most effective treatment against psorosis of orange trees [*R.A.M.*, ix, p. 523 and preceding abstract] consists in Fawcett's standard scraping method [ibid., viii, p. 640], but there is at present no known method of preventing new infections.

The scraping should extend at least 6 inches above and below the lesion. Painting treated lesions does not, in the author's opinion, give greater control, but serves as a protection against infection by various organisms; a cheap, effective after-treatment consists in a 1 per cent. solution of potassium permanganate.

After a third-stage lesion [ibid., viii, p. 640] has been treated, and two years have elapsed for proper healing, there may be found spots exuding gum, or other evidence that the disease persists. If any hard scales are found to have developed, the spots should be re-scraped with a border of about one inch. It is inadvisable, however, to re-scrape an entire treated area unless extensive active disease is present.

Removal instead of treatment is indicated in the case of small limbs, extensive third-stage lesions, especially on entire trunks or numerous small branches, very susceptible trees, and those with many extensive third-stage lesions.

Under Orange County conditions it is probably safer to interrupt treatment when the trees are wet and when a desert wind is blowing; in other parts of California it is said to be safer not to treat just before severe cold.

MAYNE (W. W.). **Annual Report of the Coffee Scientific Officer, 1930–1931.**—*Mysore Coffee Exper. Stat. Bull.* 5, 24 pp., 1 pl., 1931.

Fomes lamaoensis [*R.A.M.*, xi, p. 72] is stated to be by far the most common cause of root disease of coffee in Mysore, and it was also constantly isolated from tea roots. Traces of the disease were observed on a young Robusta coffee plant from the collar to a depth of nine inches on the tap-root, while all the lateral roots arising in this region were infected up to a distance of four inches from their point of origin, except for two which showed infection for much longer distances from the tap-root and were found to be in direct contact with the roots of a neighbouring stump about 12 inches from the surface and 20 inches horizontally from the tap-root. The only known means of controlling root disease is by the eradication of rotting timber from the soil, and this is generally too expensive to be carried out on a large scale. The second most common source of root disease is a *Rosellinia*, probably *R. arcuata* [ibid., ix, p. 129].

A *Rhizoctonia* was isolated from the tissues of coffee seedlings in nursery beds during the early part of the monsoon. A leaf spot

due to *Cercospora* sp. is prevalent among young plants but readily yields to the application of Bordeaux mixture.

Mayne (W. W.). **Seasonal periodicity of Coffee leaf disease (Hemileia vastatrix, B. & Br.). Second report.**—*Mysore Coffee Exper. Stat. Bull.* 6, 22 pp., 3 graphs, 1932.

Further investigations [the results of which are fully described and tabulated] on the seasonal periodicity of coffee leaf disease (*Hemileia vastatrix*) in Mysore [*R.A.M.*, xi, p. 41] confirmed, in all essential points, those of the previous year. A marked divergence was observed, however, in the time of maximum development of the disease, which occurred before the end of the south-west monsoon. This is attributed to the effects of shelter from the south-west monsoon winds facilitating the development of spores in the vicinity of initial infections. The early maximum is followed by a fall in percentage infection and then, in the unsprayed plots, by a secondary rise due to the infection of the new post-monsoon flush. Spraying was apparently much more effective in the control of leaf disease in 1929 than in 1930, the light and broken monsoon of the latter year evidently having been more favourable to the spread of *H. vastatrix* than the continuously wet corresponding period of the previous one. In most of the coffee-growing districts of South India two fungicidal treatments appear to be necessary for the control of leaf disease, though under certain conditions one may give satisfactory results.

Mayne (W. W.). **Die back of Coffee.**—*Planters' Chron.*, xxvi, 21, pp. 492–495, 1931.

The type of die-back of coffee branches found in southern India and described in this paper causes the death of individual shoots, crop-bearing and non-cropping, the symptoms developing on the young wood and gradually affecting the whole shoot; except in very young plants, whole branch systems or primaries are not destroyed. The symptoms were invariably noted only on totally defoliated shoots, shoots with one, or rarely, two pairs of immature leaves, or leafy shoots which had lost the apical pair or couple of pairs of leaves.

Affected shoots first turn yellow, and then brown sunken areas appear, usually extending up and down from a leaf scar. These areas blacken and spread until the whole shoot becomes affected, leaving a dead, black stick. The blackened areas bear fungal pustules [*Colletotrichum coffeanum*: *R.A.M.*, iv, pp. 166, 591], cultures from which developed the perithecia of *Glomerella* [*cingulata*: loc. cit.].

In southern India die-back of coffee occurs at three main periods: towards the end of the monsoon, after the crop, and in the hot weather; the first of which is correlated with attacks of leaf disease [*Hemileia vastatrix*] while the other two also occur during periods of physiological strain on the plant. It is considered that the condition is primarily due to physiological causes, the fungal attack being, to a great extent, secondary in character.

Defoliation alone was not found to be necessarily followed by die-back, but no differences in regard to starch content were found

which might explain why some defoliated shoots died back whereas others recovered. Nevertheless the prevention of defoliation checked die-back, as when leaf disease was controlled by spraying, and this practice, with attention to cultural measures directed to improving the general health of the bushes, are recommended for reducing the disease.

PICADO (C.). **Fusariose des Caféiers à Costa Rica.** [Fusariosis of Coffee bushes in Costa Rica.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 10, pp. 312–318, 3 figs., 1931.

A brief account is given of a disease of the coffee bush which is stated to have involved several hundred hectares of coffee plantations on the Pacific slopes of Costa Rica in 1931, following two years of severe drought. The disease, which apparently spreads in the direction of the prevailing winds, is characterized by a defoliation of the bushes or the death of the terminal buds and, in the cases when it develops at the beginning of the maturation of the coffee beans, by a die-back of the twigs and drying-up of the berries. The phloem tissues at the base of the stems show a brown discoloration which may extend in the form of streaks of varying width up to the twigs. The rootlets of affected bushes are disorganized and lesions also occur frequently on the main roots.

Isolations from diseased tissues yielded a species of *Fusarium* which on sugar-agar gave rise to pink or orange colonies bearing both microconidia (7 by 3 μ) and macroconidia (25 to 30 by 6 to 8 μ); both types of spores are also formed in sporodochia on the twigs of diseased coffee bushes in nature. In pure culture the fungus was shown to produce exodiastases which discoloured and killed living coffee twigs placed in a solution of them. The organism apparently kills the host cells in advance of its progress. Soil inoculation with pure cultures of the fungus transmitted the disease to healthy coffee plants and also to French beans (*Phaseolus vulgaris*) and broad beans (*Vicia faba*). Similar lesions to those on the coffee bushes were also found in nature on several leguminous species of plants (e.g., *Inga, Erythrina,* and *Gliricidia*), and isolations from them gave a fungus morphologically indistinguishable from the coffee one. The strain on *Inga* and *Gliricidia* developed the orange-red perithecia of a species of *Nectria* [cf. *R.A.M.*, ix, p. 229], measuring 270 μ in diameter; when cultured on the same media the ascospores produced a *Fusarium* presenting the same morphological and cultural characters as the coffee strain.

In nature this fungus was frequently associated with a species of Sphaeriaceae, with erumpent perithecia 170 μ in diameter, often containing over 36 asci with 8 hyaline and continuous spores each; pycnidia of this fungus were found in nature and were also produced in cultures from the ascospores. The pathogenicity of this organism to coffee was proved by artificial inoculation, but it is considered to be a weak parasite, capable of establishing itself only on debilitated plants. It is pointed out that conidia of the species of *Gloeosporium* and *Colletotrichum* that occur on coffee affected with anthracnose in Costa Rica give rise in pure culture to a form identical with that obtained from the ascospores of this species of Sphaeriaceae, which the author does not consider to be the same as

the *Glomerella* described by Small on coffee in Africa [*G. cingulata*: ibid., i, p. 5].

KING (C. J.), HOPE (C.), & EATON (E. D.). **The Cotton root rot fungus indigenous in Arizona deserts.**—*Science*, N.S., lxxv, 1932, pp. 48–49, 1932.

The writers have been engaged on a study of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xi, p. 240] at Sacaton, Arizona, where large areas of desert land are being brought into cultivation in connexion with new irrigation projects. In 1931, extensive patches of spore mats of the root rot organism were found in a desert area. A profuse desert vegetation existed in this area, a high level plain near the mountains, twelve miles away from the nearest cultivated fields and quite separated from any of the general drainage water channels of the region. Additional spore mats were found in the same area beneath trees and other plants. Definite injury was found to have been caused by *P. omnivorum* on the roots of *Chamaesyce albomarginata, Aplopappus heterophyllus*, and *Sphaeralcea ambigua*, but no lesions or rotted tissues were observed on those of *Prosopis velutina, Condalia lycioides* var. *canescens*, and *Opuntia arbuscula*, which also bore the mycelium of the fungus. One of two sclerotia found in a soil sample from the vicinity of the spore mats germinated in the laboratory.

These observations seem to afford definite evidence that the cotton root rot fungus is indigenous in virgin lands in the south-western United States, and to explain the occasional occurrence of the disease in the first cultivated crops planted after clearing the native vegetation.

NEAL (D. C.), WESTER (R. E.), & GUNN (K. C.). **Treatment of Cotton root-rot with ammonia.**—*Science*, N.S., lxxv, 1935, pp. 139–140, 1932.

By experiments in the cultivation of the cotton root rot fungus (*Phymatotrichum omnivorum*) [see preceding abstract] in different media, ammonia has been ascertained to produce a toxic effect on this organism, which made only restricted growth in Duggar's solution with ammonium salts as the source of nitrogen. Both the mycelial and sclerotial stages of the fungus were killed by short exposure to the gas, and where dilute concentrations of the hydroxide were applied under field conditions, the organism was destroyed in the root tissues.

In culture experiments, ammonium nitrate and ammonium sulphate, used at a concentration to yield about 12·4 gm. nitrogen per l., permitted very little mycelial growth, whereas other sources of nitrogen allowed a profuse development.

The growth of *P. omnivorum* in flask cultures was also completely inhibited by 30 seconds' exposure to the gas generated from 500 c.c. of 28 per cent. ammonia water. The sclerotia of the fungus were destroyed by exposure to ammonia gas for 10 to 20 seconds.

Field tests have also been conducted at various times during the season to compare the efficacy of 6 per cent. solutions of ammonium hydroxide, formalin, and sodium hypochlorite applied to the soil

round the roots of infected cotton plants. After 40 hours the plants were removed from the soil and the roots placed in moist chambers, observations being made at one- and five-day intervals. The plants treated with ammonium hydroxide showed no mycelial growth; slight development was made by those treated with formalin, while sodium hypochlorite failed to prevent growth.

HOPKINS (J. C. F.). **Alternaria gossypina (Thüm.) comb. nov. causing a leaf spot and boll rot of Cotton.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 136–144, 1 pl., 7 figs., 1931.

An account is given of a leaf spot of common occurrence on cotton (chiefly of the American Upland type) in southern Rhodesia, the symptoms of which are almost identical with those described by Jones from Nigeria [*R.A.M.*, viii, p. 171], except for the eventual disappearance in the Rhodesian disease of the purple margin around the lesions possibly on account of environmental conditions or varietal differences of the host plants. Occasionally the disease was also observed on the immature bolls, but field observations indicate that infection of young bolls is rare in nature; the exposed lint of ripe bolls, however, is commonly found discoloured by the fungus.

Isolations from diseased material consistently yielded a species of *Alternaria* which in pure culture produced polymorphous, catenulate, dark brown, obclavate spores with up to nine transverse and usually one or two longitudinal septa, constricted at the septa, 32 to 46 by 12 to 15μ, and provided with a hyaline, sparsely septate beak 9 to 52μ long (giving a total length of 41 to 98μ). These characters agree well with Saccardo's description of *Macrosporium gossypinum* from cotton stems, if it is admitted that in the latter the beaks were omitted from the measurements, and the new binomial *A. gossypina* (Thüm.) is provisionally suggested for the Rhodesia fungus.

Typical lesions were produced on young growing leaves by spraying them with a suspension of the spores and by placing on their surface fragments of hyphae of the fungus. Uninjured four- and sixteen-day-old bolls failed to become infected by this means, but a boll rot developed when the surface of the bolls was scratched with a needle or when the inoculum was introduced into the interior of the bolls. All the infected fruits, even though completely disorganized by the rot, remained firmly attached to the plants up to the end of vegetation, this being apparently an hereditary character of the American Upland types of cotton grown in Rhodesia.

SAWYER (W. H.). **Studies on the morphology and development of an insect-destroying fungus, Entomophthora sphaerosperma.**—*Mycologia*, xxiii, 6, pp. 411–432, 2 pl., 1 fig., 1931.

A detailed and fully illustrated account is given of the life-cycle of *Entomophthora sphaerosperma* [*R.A.M.*, viii, p. 502] in artificial culture, all the phases of which were found to agree with those observed on larvae of *Rhopobota vacciniana* in nature. The spores are considered to be true conidia, and not monosporous sporangia as suggested by some observers. They are forcibly

detached and projected from the conidiophores by a definite mechanism, the chief part in which is played by a swelling of the conidiophore tip which is forced convexly into the spore base, followed by the circumferential rupture of the attachment and a recoil of the basal membrane of the spore. The latter is provided at its distal end with a gelatinous cap, which serves to attach it to the host or any other hard surface. A relative humidity of at least 70 per cent. is necessary for the germination of the conidia, the optimum temperature for which is near 20° C.; no germination was obtained at 26° or above, while low temperatures retarded but did not prevent it; freezing did not injure the conidia. No rhizoids were formed in pure culture. The work also indicated that the resting spores of *E. sphaerosperma* are formed asexually, and that their formation is controlled by certain factors such as temperature or special nutrient media. Contrary to Gilliatt's indications [ibid., v, p. 94], and although his experiments were repeated, the author failed in all his attempts to germinate the resting spores.

CHAUDHURI (H.). **Note on a Cordyceps from Tibet.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 203–205, 3 figs., 1931.

A brief description is given of four specimens of *Cordyceps sinensis* received by the author from Tibet. These *Cordyceps* heads are considered to be a valuable tonic medicine by the Tibetans and Chinese (the celebrated Chinese Plant Worm 'Hia Tsao Tchong').

In a note appended to this paper Mr. J. Ramsbottom gives an illustration of four bundles of this fungus recently received at the Natural History Museum, London, from northern China.

LAGERBERG (T.). **Smärre meddelanden. Hsia Tsao Tung Ch'ung.** [Shorter communications. Hsia Tsao Tung Ch'ung.]—*Svensk Bot. Tidskr.*, xxv, 4, pp. 543–545, 1 fig., 1931.

The author states that a specimen of *Cordyceps sinensis* [see preceding abstract] has been brought to Sweden from China by Dr. Hummel, and placed in the Swedish State Museum. He briefly reviews the various descriptions of these bodies given in European literature since they were first reported in 1726, and also the usages they are put to in China, where, he states, they are considered as a gastronomic delicacy, besides possessing medicinal value.

VUILLEMIN (P.). **Les champignons parasites et les mycoses de l'homme.** [Parasitic fungi and human mycoses.]—291 pp., 140 figs., Paris, P. Lechevalier & Fils, 1931.

This monograph of the fungi pathogenic to man and their effects is divided into two main sections, the first of which deals with the classification of the organisms, and the second with the etiology and symptomatology of the mycoses caused by them. A final chapter briefly discusses the therapeutics and prophylaxy of the

diseases, and the volume terminates with a systematic table of the parasites.

STOVALL (W. D.) & BUBOLZ (ANNA A.). **Cultural and biochemical characteristics of Monilia isolated from human sources.**—*Journ. Infect. Dis.*, l, 1, pp. 73–88, 3 figs., 1932.

For several years the writers have been engaged on a study of the species of *Monilia* isolated from cases of bronchitis, vaginitis, and thrush—150 in all—to which have lately been added 10 cultures from the American Type Culture Collection, viz., *M.* [*Candida*] *albicans*, *M. richmondi*, *M.* [*C.*] *pinoyi*, *M.* [*C.*] *metalondinensis*, *M. pseudotropicalis*, *M.* [*C.*] *krusei*, *M.* [*C.*] *tropicalis*, *M.* [*C.*] *macedoniensis*, *M.* [*C.*] sp. from sprue, *M.* [*C.*] *psilosis*, and *M. candida* [*C. vulgaris*] [*R.A.M.*, x, p. 790].

On the basis of morphology of the colonies, carbohydrate fermentation, and action on milk, all the cultures can be grouped into three species, namely, *C. albicans* (including *M. richmondi*, *C. psilosis*, *C. pinoyi*, *C. metalondinensis*, the unnamed form from sprue, and *M. pseudotropicalis*); *C. vulgaris* (*C. tropicalis*); and a third, apparently not represented among the cultures studied. This species (only five strains of which were isolated) regularly forms a distinct pellicle in the sugar broths that it ferments and should probably be transferred to the genus *Mycoderma*. It produces no gas in maltose or saccharose and does not coagulate milk. *C. albicans* was isolated six times as often as *C. vulgaris*, and is believed to have been frequently described under other names by investigators who failed to recognize it. The present studies indicated that the cultural and biochemical characters of these organisms are remarkably constant, so that their alleged variability may be due to irregularities of technique.

CATANEI (A.). **Observations sur les caractères de souches algériennes de champignons des teignes dans diverses conditions de culture et sur leurs altérations séniles ou pléomorphiques.** [Observations on the characters of Algerian strains of ringworm fungi under different cultural conditions and on their modifications due to senility or pleomorphism.]—*Arch. Inst. Pasteur d'Algérie*, ix, 3, pp. 451–469, 1931.

A full account is given of the writer's cultural studies on *Trichophyton album* [*R.A.M.*, x, pp. 106, 243], *T. pruinosum* [ibid., x, p. 664], *T. violaceum*, *T. crateriforme*, *Achorion schoenleini*, *T. acuminatum* [ibid., x, p. 457], and *T. radiolatum* on various media other than Sabouraud's, e.g., slices of potato and carrot, potato with the addition of glycerine, cereal grain, coagulated serum, and dextrin-agar. On wheat grain *T. album* formed spores measuring 4 to 4·5 by 2·5 to 3 μ. Pleomorphism of an irreversible type, as indicated by the development of white 'duvets' hitherto observed only in *T. acuminatum*, was found to be characteristic of a number of the other species examined. Inoculation experiments on guinea-pigs with pleomorphic cultures of *T. acuminatum* and *T. radiolatum* resulted in a more discrete type of infection than that associated with the original cultures.

BAUDET (E. A. R. F.). **Les Trichophyton à culture faviforme sur milieux naturels et milieux à base de polysaccharides de Langeron et Milochevitch.** [Faviform species of *Trichophyton* on Langeron's and Milochevitch's natural media and media containing polysaccharides.]—*Ann. de Parasitol. Humaine et Comp.*, ix, 6, pp. 546–551, 2 pl., 2 figs., 1931.

On the ground of his experiments with four strains of a species of megasporic *Trichophyton* isolated from ringworm of bovines and closely resembling *T. album*, which on the usual media gave rise to faviform colonies but assumed a downy habit of growth on Langeron's and Milochevitch's natural media [*R.A.M.*, xi, p. 181, and preceding abstract], the author considers that the latter media are best adapted for the study of such organisms. The fungus developed especially well on barley grain, on which it produced the whole range of the usual fructifications.

BENHAM (RHODA W.). **Phoma conidiogena, an excitant of asthma: some observations on the development and cultural characteristics.**—*Bull. Torrey Bot. Club*, lviii, 4, pp. 203–214, 3 pl., 8 figs., 1931.

A brief morphological and cultural account is given of a species of *Phoma* with an *Alternaria* stage in its life-history [cf. *R.A.M.*, i, p. 150], which was experimentally shown to cause an extremely severe attack of asthma in a patient predisposed to the complaint, when his throat was sprayed with an extract of the fungus, with simultaneous sensitization of the skin. The organism was identified as *Phoma conidiogena* Schnegg, with which *P. alternariaceum* (loc. cit.) and *Alternaria polymorpha* Planchon are thought to be possibly identical.

BOEKHOUT (F. W. J.) & VAN BEYNUM (J.). **Red spots on molded butter.**—*Versl. Landb. Onderzoek. Rijkslandbouwproefstat.*, xxxvi, pp. 5–14, 1930. (Dutch.) [Abs. in *Chem. Abstracts*, xxvi, 4, p. 1040, 1932.]

Epicoccum (? *heterochroum*) was found to be the cause of red spots on butter in Holland. The physiological reactions of the mould were studied.

WHITE (R. P.). **Chloroses of the Rose.**—*Phytopath.*, xxii, 1, pp. 53–69, 5 figs., 1932.

A summary is given of recent literature on infectious chlorosis or mosaic of roses, from which it is apparent that this disease is widely distributed in the United States and Eastern Canada, affecting many varieties of Hybrid Tea, Hybrid Perpetual, Pernetiana, Hybrid Pernetiana, and Hybrid Wichuriana, as well as the species *Rosa manetti*, *R. multiflora*, and *R. odorata*, and the varieties Gloire des Rosomanes (Ragged Robin) and Texas Wax, all used as understocks [*R.A.M.*, x, p. 459; xi, p. 245]. A fairly extensive survey of rose stock and fields in France, Holland, and England in July, 1931, failed to reveal any cases of mosaic as it occurs in the United States, except on certain climbing varieties at Kew Gardens, which showed a veinal type of chlorosis, sometimes accompanied by slight speckling of the foliage. An amplified

description is given of the symptoms of rose mosaic, with special reference to the diverse forms assumed by the disease on different varieties, and some comparative observations are made on nutritional and insect chloroses.

GREEN (D. E.). **Further observations on the black spot disease of Roses (Diplocarpon rosae Wolf).**—*Journ. Roy. Hort. Soc.*, lvii, 1, pp. 58–62, 1 pl., 1932.

In connexion with the studies in progress at Wisley, Surrey, on the black spot disease of roses (*Diplocarpon rosae*) [*R.A.M.*, x, pp. 385, 793], data have been obtained from about 350 varieties which are here arranged in groups according to their reaction to the fungus, viz., almost free, and slight, medium, heavy, and variable infection. Juliet bushes sprayed in 1930 with 4-4-50 Bordeaux plus saponin (1 oz. to 50 galls.) [ibid., ix, pp. 195, 467] were markedly superior in 1931 to those left untreated.

JONES (L. K.) & HUBER (G. A.). **Verticillium wilt of Chrysanthemums.**—Abs. in *Phytopath.*, xxii, 1, pp. 14–15, 1932.

A species of *Verticillium* has been found causing 100 per cent. damage to certain varieties of greenhouse chrysanthemums in the State of Washington. Nineteen varieties [which are enumerated] have shown marked susceptibility to the disease, while 13 appear to be highly resistant. The causal organism seems to be carried in the cuttings taken from diseased plants of susceptible varieties, and control should therefore be based on the use of cuttings from healthy plants and on soil sterilization.

VOGLINO (P.). **Le macchie brune degli Astri della Cina.** [Brown spots of China Asters.]—*La Difesa delle Piante*, viii, 6, pp. 1–3, 1931.

After stating that in recent years China asters growing in commercial beds near Turin have been killed off during spring and autumn by *Fusarium* [*conglutinans* var.] *callistephi*, the author records that since 1928 and especially during 1930 a few individual plants in the same beds showed dwarfed branches and flowers and bore on the leaves, branches, and stems round or ellipsoidal, irregular, ochraceous-brown spots, 1 to 5 mm. in diameter, in which numerous erumpent black pycnidia developed. The latter were 150 to 200 μ in diameter and contained hyaline, elongated-elliptical spores, 6 to 8·5 (or occasionally 9) by 2·5 to 3 μ, borne on short hyaline basidia. The fungus is referred to *Phyllosticta asteris* Bresadola, previously reported only from Germany where it was observed by Sydow on living aster leaves. The parasitism of the fungus was confirmed by successful artificial inoculations of healthy, wounded asters in pots. The injury caused by it was negligible.

METCALFE (C. R.). **The 'shab' disease of Lavender.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 149–176, 1 pl., 4 figs., 2 graphs, 1931.

This is an expanded version of the author's investigation of the 'shab' disease of lavender caused by *Phoma lavandulae* in England,

the results of which have already been noticed from another source [*R.A.M.*, ix, p. 247].

VAN SLOGTEREN (E.). **Warm-waterbehandeling van Narcissen en bolrot.** [Warm water treatment of Narcissi and bulb rot.] —Reprinted from *Weekblad voor Bloembollenkultuur*, xlii, 15, 15 pp., 7 figs., 2 graphs, 1931.

The results [which are discussed and tabulated] of experiments conducted at Lisse, Holland, in the control of *Fusarium* bulb rot of narcissi [*R.A.M.*, viii, p. 383; cf. also ix, pp. 623, 700, x, p. 794] showed that the ordinary hot water treatment (immersion for $1\frac{1}{2}$, $2\frac{1}{2}$, or $3\frac{1}{2}$ hours at $43\frac{1}{2}$° C.) was quite inadequate for this purpose, actually resulting in an average reduction of 37·3 per cent. in the weight of the bulbs of the Colorable variety. On the other hand, immersion for the same periods in 0·5 per cent. uspulun, 0·5 per cent. germisan, or 1 per cent. formalin at $43\frac{1}{2}$° resulted in increased yields of 100·8, 111·6, and 106·9 per cent., respectively. The outcome of eight hours' immersion of the bulbs in the same preparations at 18° was somewhat less satisfactory.

VAN SLOGTEREN [E.]. **De behandeling van het plantgoed van Tulpen met verschillende desinfectantia. (Voorloopige mededeling).** [The treatment of Tulip bulbs with various disinfectants. (Preliminary note).]—*Lab. voor Bloembollenonderzoek te Lisse, Meded.* 41, 3 pp., 1931.

The best control of *Sclerotium perniciosum* and *S. tuliparum* on Prins van Oostenrijk, Murillo, and William Copland tulips [*R.A.M.*, x, p. 32] in a recent series of experiments in Holland was given by 8 hours' immersion of the bulbs in 1 per cent. commercial formalin at a temperature of 18° C., the increased yields from the treatment (based on bulb weight) being estimated at 91·7, 53·9, and 159 per cent., respectively, for the three varieties.

WILSON (A. R.). **Armillaria mellea as the probable cause of a disease of Iris.**—*Gard. Chron.*, xci, 2352, p. 65, 1932.

The examination, at the Department of Mycology, Edinburgh University, of wilted specimens of *Iris kaempferi* sent from the New Forest for three consecutive years, revealed the presence on the upper part of the rhizomes of extensive mycelial pockets, from which *Armillaria mellea* was isolated and cultured. Although inoculation experiments gave negative results, it seems reasonable to conclude that the fungus was the cause of the disease. The fact that the ground on which the plants were grown was formerly under timber would probably account for the large number of rhizomorphs in the soil. The only monocotyledons hitherto recorded as having been attacked by *A. mellea* in Great Britain are *Canna indica* and *Narcissus* sp.

WHITE (R. P.). **Pathogenicity of Pestalotia spp.**—*Fifty-first Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1930*, pp. 264–268, 3 figs., 1930. [Received March, 1932.]

Further experiments on the pathogenicity of various species of

Pestalozzia to ornamental plants in New Jersey [*R.A.M.*, ix, p. 389] showed that *P. palmarum* is unable to infect healthy tissues of *Howea forsteriana*, to which it gains entrance through injuries or following other fungi. *P. guepini* is also only able to penetrate the tissues of *Camellia japonica* through wounds; it may, however, cause serious damage to the host, all large injuries on which should therefore be protected by a mercury disinfectant and a wound dressing. *P. stellata* on *Ilex opaca* appears to be the weakest pathogen of the six hitherto reported, heavy spore suspensions on scalded leaves being necessary to produce infection. *P. funerea*, on the other hand, may become a serious factor in the propagation of coniferous evergreens, such as *Cryptomeria*, *Pinus*, *Chamaecyparis*, *Thuja*, and *Juniperus*, a large proportion of grafted stock being lost through attacks of this fungus. At a more advanced stage the plants may be protected by frequent applications of a chlorophenol mercury preparation (1 oz. per 3 galls. water).

BONGINI (VIRGINIA). **Sur una vaiolatura del Trifoglio e dell' Erba medica.** [On a leaf spot of Clover and Lucerne.]—*La Difesa delle Piante*, viii, 4, pp. 1–3, 1931.

In the summer of 1931 the leaves of lucerne growing in northern Italy developed small dark spots bearing on the lower surface fuliginous, single or subfasciculate conidiophores with the conidia of a *Macrosporium*. The conidiophores averaged 35 by 5μ and were septate, with a slightly swollen apex. They bore dark, smooth conidia measuring 22 to 28 by 15 to 17μ, often subglobose or even globose (15 by 15μ), usually with three transverse and one well defined longitudinal septa as well as oblique septa less dark in colour. The conidia were constricted at the median transverse septum and some were rather pointed at the base. The conidial characters differentiate this fungus from *M. medicaginis*, which causes a leaf spot of the same host, *M. meliloti*, and *M. globuliferum*. It is, however, regarded as identical with *M. sarcinaeforme* Cavara, from which Tehon and Daniel's *Thyrospora sarcinaeforme* [*R.A.M.*, v, p. 232] is considered to be distinguishable by its echinulate epispore. It is pointed out that Cavara's fungus is stated by Ferraris to have a smooth epispore and is figured as such in the Flora Italica Cryptogama (1910).

YARWOOD (C. E.). **Ampelomyces quisqualis on Clover mildew.**—Abs. in *Phytopath.*, xxii, 1, p. 31, 1932.

During the late summer and autumn of 1931, *Ampelomyces quisqualis* [*Cicinnobolus cesatii*: *R.A.M.*, x, p. 744], was apparently responsible for the almost complete destruction of *Erysiphe polygoni* on red clover [*Trifolium pratense*] on experimental plots in Indiana [ibid., viii, p. 176; cf. also xi, p. 246]. It was further isolated in pure culture from the following: *Microsphaera alni* [var.] *vaccinii* on the catalpa, *Sphaerotheca pannosa* on rose, *E. cichoracearum* on zinnia and *Ambrosia artemisiifolia*, *M. alni* on *Lonicera* sp., and an undetermined species of mildew on *Plantago major*. The isolations from the first five hosts show differential cultural characters on agar. Infection of *E. polygoni* on clover

resulted from inoculations with spore suspensions of cultures from the clover, catalpa, and rose mildews. The optimum temperature for spore germination of *A. quisqualis* and for infection of clover mildew is about 25° C. Pycnidia are produced in abundance in about six days following inoculation of living mildew, but growth and pycnidial formation are very slow in agar cultures. At 25° growth and conidial formation of clover mildew colonies may be completely arrested in about eight days after inoculation with *A. quisqualis*.

SIEGLER (E. A.) & PIPER (R. B.). **Pathogenesis in the woolly-knot type of crown gall.**—*Journ. Agric. Res.*, xliii, 11, pp. 985–1002, 4 figs., 1931.

The experiments described in detail in this paper were made in continuation of the senior author's study of the woolly-knot type of crown gall (*Bacterium tumefaciens*) on the apple [*R.A.M.*, ix, p. 188]. The chief result was to show that when seedling apple understocks were immersed in a water suspension of the organism one month before grafting a fairly high percentage of infections ensued, while when the understocks were thoroughly washed with water before grafting, the resulting trees were practically free from malformations. Ninety-four per cent. of the grafts inoculated at the point of union at the time of grafting became infected. Numerous infections also occurred on trees worked on uninoculated seedling stocks which were not washed before grafting, indicating that seedlings may be in nature a serious source of infection owing to their surface contamination with the crown gall organism. This point must be taken into consideration when interpreting the results of experiments on control either by disinfectants or by wraps.

HUBER (G. A.). **The fungi present on the surfaces of normal Apples and their relation to decay.**—Abs. in *Phytopath.*, xxii, 1, p. 13, 1932.

Unidentified species of the following genera, capable of rotting apples, were obtained from the surfaces of normal apples collected from Kennewick and the Spokane, Yakima, and Wenatchee Valleys, Washington: *Sporormia, Pyrenochaeta, Chaetomella, Aspergillus, Verticillium* (three forms), and *Podosporiella* (two forms).

CLARA (F. M.). **A new bacterial disease of Pears.**—*Science*, N.S., lxxv, 1934, p. 111, 1932.

In the course of a study on the green fluorescent bacterial plant pathogens, a highly virulent organism was obtained from a culture of *Erwinia amylovora* [*Bacillus amylovorus*], in which it appeared as a contaminant. Inoculation experiments on the fruits, flowers, and leaves of a hybrid pear, *Pyrus communis* × *P. serotina*, clearly proved the pathogenic nature of the organism, which produces round, black spots on mature foliage and on young and ripe fruits; on young leaves the spots are encircled by a yellow halo and are often accompanied by distortion. Cross-inoculation tests showed the organism to be pathogenic to cowpea, bean (*Phaseolus vulgaris*),

Pueraria hirsuta, broad bean (*Vicia faba*), beet, lilac, and bird cherry (*Prunus avium*).

The fluorescent organism was identified as a *Pseudomonas* distinct from *P.* [*B.*] *barkeri* and *P. nectarophila* [*Bacterium nectarophilum*: *R.A.M.*, xi, p. 159], and also from *P. syringae* [ibid., xi, p. 249], *P. vignae,* and *P. viridiflava,* though closely resembling the three last-named. Fluorescence may be readily observed in a medium consisting of 0·3 gm. $MgSO_4$, 2 gm. K_2HPO_4, and 3 gm. asparagin per l., adjusted to about P_H 6·9. The pathogen is named *P. utiformica* sp. nov. (according to Bergey's classification) with a technical diagnosis in English. It consists of rods with rounded ends, 1·3 to 3·1 by 0·7 to 1·5 μ, occurring singly and in pairs and motile by one or two polar flagella; is Gram-negative, non-acid fast, liquefying gelatine, producing ammonia, and fermenting dextrose, galactose, levulose, mannose, arabinose, xylose, sucrose, raffinose, mannitol, glycerine, and salicin; and it forms round or fimbriate, greyish-white to slightly greenish colonies on beef extract agar. Growth is inhibited by the presence of tartaric acid.

WORMALD (H.). **Bacterial diseases of stone fruit trees in Britain. III. The symptoms of bacterial canker in Plum trees.**—*Journ. Pomol. and Hort. Science,* ix, 4, pp. 239–256, 4 pl., 1931.

In this paper the author gives a detailed account of his investigation of the bacterial canker of plum trees in England, a preliminary description of which has already been published [*R.A.M.*, viii, p. 182]. It is considered to be probably identical with the die-back disease of plums that has been attributed to various causes in England in recent years [ibid., iii, p. 217; iv, p. 740; vii, p. 647]. The symptoms on young nursery trees are very similar to those on orchard trees; usually, however, they are more pronounced on the former, and the more severely attacked trees fail to make any growth during the season. Monthly inoculations on the stems have shown that the critical period for infection is from October to December, inclusive, since inoculations during the remainder of the year failed to give positive results.

The causal organism, whose group number has been determined as 211·2222032 in the classification of the Society of American Bacteriologists, is closely related to *Pseudomonas prunicola* [ibid., xi, p. 249], but differs from it in some cultural characters (a detailed description of which is being prepared); as it appears not to have been described previously, the name *P. mors-prunorum* is proposed for it. The paper terminates with a brief discussion of possible methods for the control of the disease.

ADAM (D. B.) & PESCOTT (R. T. M.). **Strawberry culture. Fungus diseases and insect pests.**—*Journ. Dept. Agric. Victoria,* xxx, 1, pp. 21–25, 2 figs., 1932.

Besides the insect pests enumerated in this paper, the authors state that the chief fungal diseases of strawberries in Victoria are leaf spots caused by a number of fungi, of which *Mycosphaerella fragariae* is probably the most common; plant failure, chiefly ascribed to soil deficiency and to secondary attacks by various

fungi, including species of *Pythium*, *Rhizoctonia*, and *Botrytis*; and finally, transit and market rots of the fruit, those caused by *Botrytis* sp. and *Rhizopus nigricans* being most frequently met with.

BROOKS (A. N.). **Crimp—a nematode disease of Strawberry.**—*Florida Agric. Exper. Stat. Bull.* 235, 27 pp., 5 figs., 1931.

The so-called 'crimp' disease of strawberries in Florida, which has now been shown to be due to the nematode, *Aphelenchus fragariae*, is stated to be identical with strawberry 'dwarf' occurring in Louisiana and other southern States, and possibly with 'red plant' described from Great Britain, but different from the 'cauliflower disease' also reported from the latter country [*R.A.M.*, xi, p. 250].

MUSKETT (A. E.) & TURNER (E.). **The control of American Gooseberry mildew in Northern Ireland. Part II.**—*Journ. Min. Agric. Northern Ireland*, iii, pp. 83–96, 2 figs., 1931.

Further tests conducted in Northern Ireland from 1927 to 1929 with various fungicides for the control of American gooseberry mildew [*Sphaerotheca mors-uvae*: *R.A.M.*, vi, p. 674] showed that when washing soda (with soft soap, 4 lb. per 100 galls., or skimmed milk, 1 gall. per 100 galls., as spreader) was used, it gave the best all-round results at a concentration of 2 oz. per gall., at which strength no injury was caused to the bushes. In 1927, two applications reduced fruit infection from 94 to 77·5 per cent., and on bushes sprayed in February with caustic soda (1 lb. to 5 galls.) to 56·2 per cent. In 1928, when the disease was less severe, two similar applications on bushes previously sprayed with caustic soda reduced infection from 20 to only 5 per cent. The caustic soda treatment did not improve the highly satisfactory control given by ammonium polysulphide, though it did enhance the somewhat unsatisfactory control given by alkaline Burgundy mixture (8-20-100) and by ammonium copper carbonate.

In 1928, finely ground sulphur applied with a small hand bellows at the rate of 2 lb. of sulphur for 16 medium-sized, five-year old bushes, the treatment being given on two sunny days about noon and the bushes previously sprayed with water, reduced infection from 80 to 6 per cent., the latter figure being only 1 per cent. when the bushes were sprayed in February with caustic soda. A year later, the same form of sulphur applied on two occasions at noon to perfectly dry leaves not previously treated with caustic soda reduced infection from 95 to 3·75 per cent.; flowers of sulphur gave an equally good result, and ammonium polysulphide plus soft soap gave 5 per cent. infection.

It is concluded that sulphur dusting and ammonium polysulphide spraying are equally efficacious in the control of the disease, but that on bushes highly susceptible to sulphur injury (e.g., the Amber varieties) the best treatment hitherto found is spraying with washing soda and soft soap.

The search for existing resistant varieties suitable for commercial purposes failed.

This work terminates eight seasons' experiments and leads to the

conclusion that satisfactory control of American gooseberry mildew may be obtained by two applications in summer of: (1) ammonium polysulphide spray 1 in 200 plus 4 lb. soft soap per 100 galls. (cost 15*s.* 6*d.* per 100 mature bushes); or (2) a good ground sulphur dust or flowers of sulphur, about 20 lb. per 100 bushes (cost 12*s.* per 100 bushes); or (3) lime-sulphur 1 in 100 plus 1 gall. skimmed milk or 4 galls. flour paste per 100 galls. (cost 11*s.* per 100 bushes).

Amber and other varieties liable to sulphur injury should be sprayed in February with caustic soda (2 lb. per 10 galls.) and then receive two summer sprayings with washing soda (2 oz. per gall.) plus 1 gall. skimmed milk per 100 galls. (cost 19*s.* 6*d.* per 100 bushes).

COOLEY (L. M.) & RANKIN (W. H.). **Virus disease control experiments in Black Raspberry plantings in 1931.**—*New York* (*Geneva*) *Agric. Exper. Stat. Bull.* 601, pp. 3–6, 1931.

Experiments were started in 1931 on the control of virus diseases, especially red mosaic, in the black raspberry [*Rubus occidentalis*] plantings of Erie County, New York [*R.A.M.*, x, p. 530]. Twenty-two plantings, comprising 84,000 plants of the Cumberland and Plum Farmer varieties, were made by sixteen co-operating growers for the trials, each planting being inspected twice (from 7th July to 15th August and from 9th to 29th September).

In the parent Cumberland plantings (originating in Ohio where inspection and roguing are regularly carried out) red mosaic was present to the extent of 0·07 and 0·06 per cent. in 1930 and 1931, respectively, while in the New York plots 0·83 per cent. of the 49,337 plants of this variety were affected; increases in red mosaic were also observed in some of the New York Plum Farmer plantings (0·49 compared with 0·07 and 0·44 per cent. in Ohio in 1930 and 1931, respectively). On the other hand, the incidence of severe streak [ibid., x, p. 804] was considerably lower in New York than in Ohio (0·18 per cent. in Cumberland and 0·02 per cent. in Plum Farmer compared with 0·36 and 1·09 per cent. in 1930 and 1931, respectively, for the former and 0·74 and 0·17 per cent., respectively, for the latter, in Ohio).

In most of the experimental plots an invasion of the red mosaic virus from outside sources was indicated—probably diseased wild or cultivated red, and to a lesser extent purple [*R. neglectus*] and black raspberries within a 50 ft. radius. In some of the test plantings red mosaic had apparently spread from neighbouring cultivated Columbian plants showing the typical mild mosaic symptoms.

KAISER (P.). **Das Rutensterben der Himbeeren.** [Cane blight of Raspberries.]—*Gartenflora*, lxxxi, 1, p. 24, 1932.

Cane blight of raspberries, which is stated to be constantly on the increase in Germany, is usually attributed to *Didymella applanata* [*R.A.M.*, x, p. 804], but the writer suspects, from observations and experimental work, that the primary agent of the disease is a gall fly belonging to the genus *Diplosis.* The fungus enters the canes through the wounds made by the insects in feeding and thence spreads to the healthy parts of the cortex. The

Diplosis larvae emerge from the eggs early in April and begin to feed below the cortex. Control measures should be based on the joint extermination of insect and fungus and should include liberal applications of lime to the soil, sparing use of nitrogen, repeated spraying in the spring with 1 per cent. solbar or Bordeaux mixture, and careful selection of healthy seedlings.

RHOADS (A. S.). **Clitocybe mushroom root rot—a new disease of Bananas.**—Abs. in *Phytopath.*, xxii, 1, p. 23, 1932.

Mushroom root rot (*Clitocybe tabescens*) [see above, p. 365] has been found attacking and killing bananas of several varieties, including Dwarf Cavendish, at Artesia and Nocatee, Florida. The bases of the diseased plants showed a watery, brownish discoloration, with sheets of mycelium and a luxuriant development of rhizomorphs between the leaf stalk bases and within the loose tissues of the same. The rhizomes of infected plants were permeated by numerous mycelial sheets, and the fungus spread to all the plants in the clump, which was eventually killed.

ASHBY (S. F.). **Gloeosporium strains. Notes on thirty-two isolations of Gloeosporium from Bananas in Trinidad.**—*Trop. Agriculture*, viii, 12, pp. 322–325, 1 pl. [facing p. 332], 1931.

The author states that the cultural study of 32 strains of *Gloeosporium* isolated from banana fruits in Trinidad showed that four of these strains produced perithecia in culture and are referable by the characters of their ascogenous stage to *Glomerella cingulata* [*R.A.M.*, x, p. 483]; the range of the spore measurements of their conidial stages was 11·5 to 19 by 4·5 to 6·3 μ. Of the remaining 28 strains, all of which are referred, in the absence of the perfect stage, to *Gloeosporium musarum* [ibid., xi, p. 189], 21 are regarded as representing the normal type with conidia that are very uniform in shape and vary in size within the limits 11·5 to 17 by 5 to 7 μ, and seven exhibit a more or less appreciable variation from the normal type, their conidia being less regular and ranging in size from 12 to 17 by 4·5 to 6·5 μ. It is pointed out that isolations from green bananas in Ceylon and from ripe bananas in the Central Provinces of India produced types of growth and conidia in pure culture which were quite similar to those of some members of the normal Trinidad group.

A description is given of the morphological and cultural characters of the various strains and a note on the type specimen of *G. musarum* in Kew Herbarium, the spores of which were found by Miss Wakefield to be 12 to 20 by 5 μ (mean about 15 by 5 μ) and not 10 to 12 by 4 μ as given in the original diagnosis. All the author's strains produced, in addition to the free conidiophores, others lining the cavities of black, hemispherical or irregular, stromatoid, pseudoparenchymatous surface outgrowths, which eventually opened exposing the hymenial layer.

WARDLAW (C. W.). **Banana diseases. 3. Notes on the parasitism of Gloeosporium musarum (Cooke & Massee).**—*Trop. Agriculture*, viii, 12, pp. 327–331, 1 pl. [facing p. 313], 1931.

In this, the third paper of this series [*R.A.M.*, xi, p. 312], the

author gives an account of the fruit rot of bananas caused by *Gloeosporium musarum* in Trinidad, where the fungus has been observed in storage or transit attacking the main stalks, finger stalks (causing finger drop), and the fingers in the form of spots, blemishes, or a conspicuous tip-rot [ibid., x, p. 806], but never on unreaped immature fruit. Field inoculations [details of which are given] with three strains belonging to Ashby's 'normal' group [see preceding abstract], both during the wet and the dry season, gave negative results on fruits of varying age still attached to the plants. Further experiments indicated that the fungus attains its greatest activity on fruits approaching maturity in storage, and that infections established at tropical temperatures are responsible for the greatest amount of wastage. These observations lead the author to consider that successful control of the rot caused by *G. musarum* during sea transport in cold storage may be ensured by the following measures: reaping the fruit at the correct stage of maturity, reducing to the minimum the time during which the reaped fruit is exposed to tropical temperatures, rapid cooling in the holds, careful handling of the fruit, and rapid ripening after unloading. Some histological details are also given of the invasion of the fruit tissues by the fungus.

CHEESMAN (E. E.). **Banana breeding at the Imperial College of Tropical Agriculture. A progress report.**—*Empire Marketing Board Publ.* 47, 35 pp., 9 pl., 1931.

In this paper the author reports on the progress so far attained in the task initiated in 1922 at the Imperial College of Tropical Agriculture, Trinidad, of breeding a variety of banana which should both possess the qualities required by the trade and be resistant to Panama disease [*Fusarium cubense*: *R.A.M.*, xi, p. 61]. Considerable details are given of numerous interspecific crosses which were attempted in the genus *Musa*, among which the commercially most suitable Gros Michel banana when pollinated with a fertile species, believed to be *M. malaccensis*, produced a few seeds from which plants have been raised closely resembling the Gros Michel parent. One of these, which has been named I.C. 1. [Imperial College No. 1], has shown resistance to Panama disease, and is being propagated vegetatively for further studies, but it does not back-cross readily to Gros Michel, and further progress in this direction is not very promising. About half of the eighty varieties of bananas collected at the Imperial College proved capable of producing seed, and progenies are being raised for study from those that have good commercial qualities.

WARDLAW (C. W.) & MCGUIRE (L. P.). **Transport and storage of Bananas with special reference to chilling.**—*Empire Marketing Board Publ.* 45, 40 pp., 7 figs., 1931.

This report is the complete account of the authors' investigations conducted in Trinidad to find a substitute for the Gros Michel banana [owing to its susceptibility to *Fusarium cubense*] and to prevent wastage during transit, a full summary of which [erroneously stated to be a précis of a previous report] has already been noticed from another source [*R.A.M.*, x, p. 806].

Curzi (M.). **Una nuova specie di 'Helminthosporium' in una malattia del Banano segnalata nella Somalia Italiana.** [A new species of *Helminthosporium* in a disease of Banana reported in Italian Somaliland.]—*Rendic. R. Accad. Lincei*, xiv, Ser. 6, 3–4, pp. 146–149, 1 fig., 1932.

Canary bananas (*Musa cavendishii*) in Italian Somaliland recently developed an extensive spotting with which a species of *Helminthosporium* was constantly associated. On the stems and scapes the spots appeared as deep-seated necroses, sometimes sunken, cracked, and surrounded by a well-marked margin; on the leaves they extended for the most part over entire sections of the blade, and were bordered by a dark line. The conidiophores were sparse, fuliginous, erect, septate, the distal end being somewhat irregularly thickened, contorted, undulating, and showing scars corresponding to the attachment of the conidia. The latter were light olivaceous at first then suddenly darkening, with the third or penultimate cell darker and larger than the rest, and the end cells lighter and slightly tapering towards the apex and base. After the first stage in their development they ceased to be equilateral and, at maturity, one side was almost flat or even concave, while the other was markedly convex. Over 95 per cent. of the conidia were triseptate and measured 20 to 34 by 11 to 16 μ. Germination occurred only from the two polar cells. Other ellipsoidal or clavate, slightly curved, 5- to 9-septate macroconidia were observed only in necrosed areas on the pseudo-stems and scapes; they were a lighter fuliginous colour than the microconidia, and measured 55 to 87 by 12 to 15 μ.

The author considers his fungus to be a new species belonging to the *Eu-Helminthosporium* group [*R.A.M.*, viii, p. 529] and names it *H. gibberosporum*.

Artificial inoculations of *M. sapientum* in the Botanical Gardens, Rome, with pure cultures of the fungus gave positive results.

Fellers (C. R.) & Clague (J. A.). **Souring of Dates by yeasts.**—Abs. in *Journ. of Bact.*, xxiii, 1, p. 63, 1932.

Spoilage of commercial dates by yeasts is stated to cause considerable losses, especially in wet seasons [cf. *R.A.M.*, x, p. 656]. Sour fruit is usually soft, dark, and aromatic in odour and flavour. Souring is apt to occur when the moisture content exceeds 23 to 25 per cent. Several closely allied types of yeasts were isolated from soured samples of Iraq, Algerian, and Californian dates. The organisms were grown in pure culture and produced typical souring in sound, pasteurized dates with a moisture content of about 25 per cent. *Acetobacter* was sometimes associated with the yeasts on sour dates. Souring may be effectively controlled by drying the fruit to a maximum moisture content of approximately 23 per cent. and maintaining it during shipment and storage at or preferably below this figure. Pasteurization of the dates by holding them at 160° F. for one hour at a relative humidity of about 70 per cent. is a further effective control measure.

Lacy (M. E.). **Stationary spray plants for commercial and farm orcharding.**—*Agric. Engin.*, xiii, 1, pp. 19–20, 2 figs., 1932.

Details are given of the 15 stationary spray plants inspected by

the writer in Georgia orchards [cf. *R.A.M.*, x, p. 673]. These are mostly used by apple growers, but there are several in pecan groves, and one in a 160-acre peach orchard. The average cost of the complete installation is $31·16 per acre. The engines used include Fords, Chevrolets, and Bean Le Roi with a range of 6 to 22 h.p. The length of hose used ranged from 150 to 400 ft.

The stationary spray plant.—*Fruit World of Australasia*, xxxii, 9, pp. 513–514, 2 figs., 1931.

After referring to the great success which has attended the installation of stationary spray plants [see preceding abstract] in orchards in New Zealand, Tasmania, and the Pacific coast area of the United States, the author gives some interesting details received from Tasmanian growers as to costs, manner of arrangement, etc., of such outfits. Ample evidence has been obtained that the stationary system can be made to halve the cost of spraying, even taking the capital charges into consideration, while it also enables the trees to be sprayed at any critical time, whatever the condition of the ground. Incidental advantages are the better spraying obtainable as a result of the higher pressures used, the avoidance of damage to trees and crop, and the greatly reduced cost of upkeep as compared with that of portable sprayers.

WILCOXON (F.) & MCCALLAN (S. E. A.). **The fungicidal action of sulphur. III. Physical factors affecting the efficiency of dusts.**—*Contrib. Boyce Thompson Inst.*, iii, 4, pp. 509–528, 1 fig., 5 graphs, 1931.

Studies were carried out, by methods previously described [*R.A.M.*, x, p. 741], to determine the physical factors influencing the toxicity of sulphur dusts towards *Sclerotinia americana*. The so-called 'straight' dusts (i.e., those consisting of ground sulphur without additional substances) used in the tests were 200-mesh sulphur (Niagara Sprayer & Chemical Co., Middleport, N.Y.), dusting sulphur (Ansbacher-Siegle Corp., New York), Aero Smoke (American Cyanamid Co., New York), and 300–7 dusting sulphur (National Sulphur Co., New York). The modified dusts (those to which gums, proteins, infusorial earth, bentonite [ibid., x, p. 533], or the like are added to modify the properties of the sulphur) were sulpho-tone (Lucas Kil-Tone Co., Vineland, N.J.), Orchard brand dritomic sulphur (General Chemical Co., New York), and kolodust (Niagara Sprayer & Chemical Co.). The sprays consisted of two suspensions, viz., flotation ferrox sulphur (Koppers Products Co., Pittsburgh) and mulsoid-sulphur (Sherwin Williams Co., Cleveland), and two colloids, namely, colloidal sulphur (Premier Mill Corp., Geneva, N.Y.) and ialine (Burt, Boulton, and Haywood, Ltd., London) [ibid., xi, p. 194].

The results of the trials [which are fully discussed and tabulated] showed that the straight dusts are at least equal in toxicity to the modified ones, even after exposure to artificial 'rain' for 30 seconds (0·3 inches of 'rain'). Adherence to a smooth surface was inversely proportionate to particle size. The colloidal sulphur sprays were found to be more toxic than the other preparations when tested on an equal weight basis. No correlation could be

found between the toxicity of the dusts and the acidity of their water extracts.

A convenient method for the determination of the mean particle size of sulphur dusts is described, involving a count of the number of particles furnished by a known weight of sulphur dusted on a surface of known area. The relative toxicity of the sulphur dusts was shown to be directly proportionate to the number of particles. The mean particle diameters of Niagara-200, Ansbacher-Siegle, and National 300–7 were found to be 26·5, 22·4, and 18·0 μ, respectively. These dusts showed no significant differences in toxicity when applied to give the same number of particles per unit area. On an equal weight basis the mean particle size of the dusts, therefore, is the most important single factor contributing to their toxicity. The dimensions of the particles of ialine and Premier Mill were 0·5 and 2·4 μ respectively.

A useful measure of the dusting qualities of sulphur in regard to the properties of flowing freely and forming a cloud was found in the 'angle of slope', i.e., that between the side and the base of a cone of dust built up to the maximum height attainable. The dusts showing small angles of slope, i.e., sulpho-tone (44°18′), National 300–7 plus 5 per cent. inert filler (44°32′), and kolodust (45°48′) dust more freely and flow better than those with larger angles.

ORTON (C. R.). **Seed-borne parasites—a bibliography.**—*West Virginia Agric. Exper. Stat. Bull.* 245, 47 pp., 1931.

The present list of bibliographical references to the more important papers on seed-borne diseases of plants (using the word 'seed' to connote the bodies containing an embryo and employed for propagation) is preceded by concise notes on the early history of seed transmission of parasites; the distribution of important plant diseases by seed; the manner in which pathogens are seed-borne; the nature of seed-borne parasites; and the commercial aspect of seed transmission of the parasites.

CUNNINGHAM (G. H.). **Standardization of common names of plant diseases.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 145–148, 1931.

In pointing out the inconsistencies noticed by him in the list of common names of plant diseases suggested by the Plant Pathology Sub-Committee of the British Mycological Society [*R.A.M.*, viii, p. 517], which are considered to be a source of confusion, the author states that a way out of the difficulty would be for each pathogen, where it is known, to bear a common name, irrespective of the number of symptoms caused by it or of its host range. A start in this direction has already been made in modern literature, as instanced by the designations 'American mildew' and 'European mildew' for *Sphaerotheca mors-uvae* and *Microsphaera grossulariae*, respectively, on the gooseberry, and black rust and yellow rust for *Puccinia graminis* and *P. glumarum*. The name selected should be easy to pronounce, in order to render it acceptable in general practice, and, in the case of common names already in use, preference should be given to the one most generally employed in the British Empire, a point which can be settled by consultation with

the official Chief Mycologist in each Dominion. Attention should also be given to the appropriateness of the term selected.

Hannan (A. M.). **The influence of weather on crops: 1900–1930. A selected and annotated bibliography.**—*U.S. Dept. of Agric. Misc. Publ.* 118, 245 pp., 1931.

This bibliography of 2,324 titles of papers published between 1900 and 1930, arranged alphabetically under authors, dealing with various aspects of phenology in relation to crops, contains a number of references to the influence of weather on plant diseases.

Euler (H. v.), Gard (Ulla), & Rislund (G.). **Katalase- und Zuckerbestimmungen in chlorophyll-defekten Pflanzen.** [Catalase and sugar determinations in chlorophyll-deficient plants.]—*Hoppe-Seyler's Zeitschr. für Physiol. Chemie*, cciii, pp. 165–176, 2 graphs, 1931.

Studies at the Biochemical Institute, Stockholm, on the leaf constitution of three types of chlorophyll-deficient plants, viz., hereditary white, yellow, and green barley mutants, variegated *Pelargonium zonale* and *Antirrhinum*, and *Abutilon striatum* with infectious chlorosis [*R.A.M.*, xi, p. 256] showed a general correlation in all cases between chlorophyll deficiency and the reduction of other substances, especially catalase. The white leaf portions of *A. striatum* contained barely a trace of tryptophane, the amount of which in the green parts was 0·76 per cent. of the dry weight.

Kondo (T.). **Zur Kenntnis des N-Gehaltes des Mykorrhizaknöllchens von Podocarpus macrophyllus D. Don.** [Contribution to the knowledge of the N-content of the mycorrhizal nodule of *Podocarpus macrophyllus* D. Don.]—*Bot. Mag.*, Tokyo, xlv, pp. 495–501, 1931. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 1, p. (8), 1932.]

Determinations by the micro-Kjeldahl method of the nitrogen content of young and old mycorrhizal nodules of *Podocarpus macrophylla* [cf. *R.A.M.*, xi, p. 258] showed that soluble amide-, amino-, and ammonia-nitrogen are much more abundant in young nodules and roots than in old ones. In the former, therefore, a relatively large quantity of nitrogen is accumulated in a readily transportable form.

Cappelletti (C.). **Sulla presenza di miceli nei tegumenti seminali di alcune Liliaceae e particolarmente nel genere Tulipa.** [On the presence of mycelia in the seed coat of some Liliaceae particularly in the genus *Tulipa*.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxviii, 3, pp. 479–508, 5 figs., 1931.

After stating that he has frequently observed the presence of fungal mycelium on the seeds of Liliaceae (*Tulipa*, *Lilium*, and *Fritillaria* spp.), the author gives a detailed account of the physiological significance of this association, which he regards as a new type of symbiosis, and describes the mode of penetration of the fungi concerned.

Mycelium was commonly noted on the outermost part of the seed coat in proximity to the open stomata; once established in the

thickness of the tegument, the fungus easily spreads therein as the deep cellular layers develop wide intercellular spaces through which the hyphae can pass around the whole seed-coat.

Infection of *Tulipa* seed was ascertained to take place during the ripening of the fruit. The best germination of the seeds was obtained at 0° to 6° C., which retarded the growth of the mycelium. At laboratory temperatures (14° to 18°) the fungi developed so vigorously that germination was inhibited.

The fungus most commonly found was *Sclerotium tulipae* Libert, while a new species, *Mycogone tulipae* [of which a Latin diagnosis is given], was also frequently found.

Only these two and some species of *Penicillium* were deep-seated, various other fungi that were present being regarded as unimportant.

Evidence was obtained that the stigma became infected in the first stages of its development, and the infection then spread to the carpellary wall. At the base of the carpels, at the insertion of the peduncle (inside the fruit), infection appeared rather late, shortly before the seed ripened. Infection was not transmitted to the young plants developing from the infected seeds nor was there any connexion between the fungi in the seed coats and those forming mycorrhiza.

The author considers that there is no doubt that the seeds remaining in the fruit when the latter has reached an advanced stage of maturity can become infected through the carpellary walls, the mycelium finding in the hot, moist carpellary cavity during the drying of the seeds a highly congenial environment. By reason of the slight effect produced upon the life of the plant the author considers that this seed infection of Liliaceae is a type apart, which he refers to as the '*Tulipa*' type of seed infection.

A bibliography of 16 titles is appended.

SMITH (F. E. V.). **Raising Orchid seedlings asymbiotically under tropical conditions.**—*Gard. Chron.*, xci, 2349, pp. 9–11, 4 figs., 1932.

A fairly exhaustive examination of hybrid *Cattleya* roots in Jamaica having shown that the mycorrhizal fungus [*Rhizoctonia repens*: *R.A.M.*, xi, p. 317] is very sparsely represented, experiments [which are fully described] have been successfully carried out in the asymbiotic germination of the seed of *Cattleya*, *Broughtonia*, *Epidendrum*, *Phalaenopsis*, and *Renanthera* by Knudson's method with certain modifications. The seed was removed from the capsules before dehiscence and sterilized with a saturated filtered solution of bleaching powder. It was then sown in Freudenreich flasks on pulped filter paper saturated with the nutrient solution at P_H 4·5 to 5, Knudson's solution B being that chiefly used, sometimes with increased nitrogen.

NORD (F. F.) & WEIDENHAGEN (R.). **Ergebnisse der Enzymforschung. I Band.** [Results of enzyme research. Volume I.] —xi+377 pp., 11 figs., 2 diags., 48 graphs, Leipzig, Akademische Verlagsgesellschaft M. B. H., 1932.

In order to facilitate the study of the enzymes, it is proposed to

collect and publish at intervals a series of papers on the most important aspects on this subject, the literature on which is at present scattered through numerous scientific and medical journals. Owing to the position of enzymology on the borderline between physiology and chemistry, considerable difficulty may be experienced in keeping in touch with the available information on specific problems, a general survey of which will in future appear under the author's name as separate parts of these volumes.

The following are included in the present volume. (1) The thermodynamics of cells reactions, by E. I. Fulmer (English). (2) Significance of potentials of oxido-reduction for enzymatic reactions, by R. Wurmser (French). (3) Mechanism of enzymatic action, by A. Fodor (German). (4) Physico-chemical processes in enzyme reactions, by F. F. Nord (German). (5) Alcoholic fermentation. Fermentation in the yeast cells, by A. Harden (English). (6) Proteolytic enzymes of the animal and plant kingdoms, by W. Grassmann (German). (7) Specificity and mode of action of the carbohydrases, by R. Weidenhagen (German). (8) Bacterial enzyme reactions, by J. H. Quastel (English). (9) Vinegar fermentation, by A. Bertho (German). (10) Tyrosinase, by H. S. Raper (English). (11) Bone phosphatase, by R. Robison (English). (12) Crystalline urease, by J. B. Sumner (English). (13) Crystalline pepsin, by J. H. Northrop (English). (14) The oxygen-transmitting ferment of respiration, by A. Reid (German). (15) Biochemistry of the lower fungi, by H. Raistrick (English) [*R.A.M.*, xi, p. 119]. (16) On the development of activity in plant enzymes, by K. Suessenguth (German).

SCARAMELLA (PIERA). **Sugli enzimi e sulle tossine prodotte dal 'Rhizopus nigricans' Ehr. in rapporto alla loro azione sulla germinazione del Grano.** [On the enzymes and toxins produced by *Rhizopus nigricans* Ehr. in relation to their action on the germination of Wheat.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxviii, 3, pp. 371–408, 2 pl. [facing p. 578], 1931.

Studies [which are described in detail, and the results of which are tabulated and fully discussed] of the enzymes and toxins produced by *Rhizopus nigricans* [cf. *R.A.M.*, iii, p. 157; see also ibid., ii, pp. 464, 564] when grown in various [named] liquid media, and of their effect upon the germination of wheat seed showed that in vegetable broths prepared by triturating prunes, carrots, or potatoes in water, boiling for 30 mins. at 1·5 atmospheres, filtering, adjusting the reaction, and again autoclaving for 20 mins. the mycelium of *R. nigricans* produced pectinases abundantly, as determined by their macerating effect on carrot or potato disks, but in meat broth and synthetic liquids their presence could not be established; the greatest amount of pectinases was liberated in carrot and prune broth, and somewhat less in potato broth. In the decoctions used (potato and carrot) no pectinase was formed.

The greatest weight of mycelium was produced in prune broth, followed by carrot and potato broth. In Raulin's solution fructification was very rapid, while in meat broth it was very slow. At 18° C. the greatest amount of macerating principles developed in the mycelium after seven days. In carrot broth a very active

enzyme formed, capable of completely dissolving the middle lamella of carrot disks 100μ in thickness in under three hours and able to retard or inhibit the germination of wheat seed. The materials liberated by the fungus were very slow to penetrate the integument of wheat seed, but in the earliest stages of growth of the seedling the inhibiting action developed almost immediately. Wheat seed left for 12 hours in carrot broth in which *R. nigricans* had been grown, the seed then being left to germinate in the same liquid, was seriously injured: during the first 24 hours no germination occurred, after 48 hours there was 24 per cent. germination, and after 15 days a maximum of 35 per cent. was reached; the leaflets of the embryo did not emerge from the coleoptile, and there was no root development.

In potato broth active principles were also formed, but much more slowly than in carrot, and when produced they were weaker. In prune broth a very active macerating principle was produced. In meat broth and Raulin's medium no macerating enzyme was present, nor was any found in the mycelium grown in these media.

When up to 30 per cent. glucose was added to the liquid media it favoured the growth and fructification of *R. nigricans*, but higher concentrations reduced them, though fructification took place in concentrations up to 70 per cent. The fungus continued very slow growth even in a glucose concentration of 100 per cent. In the presence of over 10 per cent. glucose, independently of the P_H value of the medium, there was no production of pectinase. When glucose was added in various proportions to carrot broth in which *R. nigricans* had been grown and which was very rich in enzymes, and the liquid was allowed to act upon carrot disks, it was ascertained that a concentration of 3 per cent. glucose did not affect the action of the pectinases, one of 5 per cent. retarded it, and higher concentrations inhibited it.

The presence of growing *R. nigricans* affected the P_H value of both carrot and prune broth; when the solution was very acid the fungus tended to make it neutral and when alkaline, acid. The activity of the enzymes formed was directly related to the P_H value of the medium; at P_H 2·4 48 hours elapsed before the middle lamella of the carrot disks was dissolved, and the liquids had a slightly toxic effect on the germination of wheat. Enzyme action became progressively more intense as the P_H value rose to 5·6, when only 4 hours were required to dissolve the middle lamella of carrot disks, the percentage germination of wheat also being reduced. At about P_H 7 enzyme action ceased, but it began again at P_H 7·6, falling at higher concentrations.

During the first three weeks that *R. nigricans* was kept in culture, pectinases were produced in abundance; after one month the middle lamella of the carrot disks was no longer dissolved and the germination of wheat seed was unaffected. Boiled liquids in which *R. nigricans* had been cultured, however, became, progressively with the age of the culture, increasingly injurious to the germination of wheat seed. This was evidently due to the production of toxins and the toxic action progressively increased as enzyme action declined.

De Tomasi (J. A.). **Immunity in plants.**—*Phytopath.*, xxii, 1, pp. 95–102, 1932.

A review is given of the more important recent literature and investigations on congenital and acquired immunity in plants [*R.A.M.*, x, p. 612], the former phenomenon being considered under three aspects, viz., (1) mechanical defences dependent on the anatomical structure of the tissues; (2) actions of normal cellular and intercellular fluids before the parasitic attack; and (3) histogenic and humoral reactions of tissues to parasitic infection. Acquired immunity is discussed under the heads of vaccination and superinfection.

Dufrénoy (J.). **L'immunité locale.** [Local immunity.]—Reprinted from *1er Congrès. Internat. Microbiol.*, Paris, *1930*, 7 pp., 7 figs., 1931.

After pointing out that *Blepharospora* [*Phytophthora*] *cambivora* produces only very superficial necrosis of the tissues of Far Eastern varieties of chestnut [*R.A.M.*, vii, p. 549; x, p. 68], the author states that in the tissues which the fungus attempts to attack, the cells situated some distance away from those already parasitized show profound metabolic disturbances: in particular the content of the vacuoles becomes rich in phenolic compounds, with the result that the penetration of an electrolyte or of various suspensions causes the formation of abundant intravacuolar phenolic precipitates. This formation of phenolic compounds in cells threatened with infection corresponds to local immunity [ibid., ix, p. 51].

In the case of parasites which cause localized lesions, such as circular spots on leaves or branch cankers, the cells at first react as if susceptible, but around those which have become invaded a layer of cells accumulates phenolic compounds and bars the further advance of the fungus. Thus, in the centres of the leaf spots produced on *Arisaema triphyllum* by *Uromyces caladii*, those produced on *Asphodelus* by *Puccinia asphodeli*, and certain spots produced by *P. sorghi* [*P. maydis*] on susceptible maize varieties, the cells penetrated by the haustoria remain living and may even show a greater or more lasting activity than the healthy cells (in autumn the persistent green spots on the yellowing leaves of *Asphodelus* correspond with the areas invaded by the rust) [cf. ibid., vi, p. 632]. The cells penetrated by the fungus retain their green plastids and show actively dividing mitochondria arranged in lines along the cytoplasmic trabeculae separating the small vacuoles which are poor in phenolic compounds. At the periphery of the spot, beyond the infected area, the unaffected cells are found to have retained their large central vacuole and to have accumulated phenolic compounds.

Johnson (B.). **Specificity to penetration of the epidermis of a plant by the hyphae of a pathogenic fungus.**—*Amer. Journ. of Botany*, xix, 1, pp. 12–31, 1 pl., 1 fig., 1932.

Little experimental work has been done on the problem of 'specificity' to attack by disease-inducing organisms, as distinct

from immunity, resistance, and susceptibility, the term 'specificity' against a parasite being used in the sense of any immunity connected with species and genera.

Colletotrichum circinans, the causal organism of onion smudge [*R.A.M.*, x, pp. 499, 701], is usually considered to be limited in its host range to *Allium* spp., though it has been found capable of attacking apple fruits [ibid., i, p. 278]. Experiments were therefore conducted to ascertain whether this fungus could penetrate a number of other plants grown as far as possible under ordinary greenhouse conditions. Penetration of the leaf epidermis was found occasionally in most of the plants tested [a list of which is given]. The epidermal walls reacted by the formation of penetration pegs, staining with magdala red, underneath the appressoria, but only a few showed the passage of an infective hypha into the cell. Of the hosts studied the onion was the only one showing no formation of pegs.

Peas, *Eschscholzia californica*, nasturtium (*Tropaeolum majus*), and green leaves of onion all showed apparently normal hyphae ramifying throughout the tissues, some of which were more or less disintegrated after three days. When inoculated leaves of the other hosts tested were surface-sterilized and incubated in prune agar it was found that nearly all the hosts sometimes contained viable mycelium of the fungus after three days. When young plants were inoculated, nearly all the hosts tested sometimes developed lesions, and acervuli formed in many. In some the attack was so severe that the plant perished. Peas developed a disease characterized by wilting. curling, and browning of the leaves when kept in a moist chamber after inoculation, but not under ordinary greenhouse conditions.

These studies (which were supplemented by a statistical classification of the reactions of 19 plants) give no indication of narrow specificity in the response of the leaves of various experimental hosts to infection by *C. circinans*.

STEINBERG (R. A.). **An apparatus for growing plants under controlled environmental conditions.**—*Journ. Agric. Res.*, xliii, 12, pp. 1071–1084, 3 figs., 5 graphs, 1931.

A detailed description is given of the construction and working of an improved apparatus for growing experimental plants under controlled conditions of light, temperature, humidity, air velocity, and soil moisture [cf. *R.A.M.*, ix, p. 523]. An even distribution of light is effected by the use of a 1,000-watt 110-volt gas-filled tungsten lamp enclosed in a globular water screen, the temperature within which is kept down by the circulation of cold water. Temperature, air humidity, and air velocity are controlled by a modified blast heating system with a pneumatically regulated air washer, and an automatic watering system maintains constant soil moisture and records transpiration. The apparatus is also adapted to conduct experiments with coloured light. It is stated that the results of experiments made with this apparatus agree within an error of 10 per cent. with those obtained in the open.

BRETT (MARGARET A.). **Cyclic saltation in Stemphylium.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 89–101, 1 pl., 4 figs., 1931.

A detailed account is given of a species of *Stemphylium* which was maintained in pure culture for over two years, and which, when grown on media of low nutritive value, produced two types of growth, namely, a slow growing, dark type, profusely sporulating in dense heads, and a lighter coloured, rapidly advancing type, with a weaker production of aerial spores and an abundant formation of submerged spores. In the original cultures the densely sporulating growth was disposed in radiating bands, the more sparsely sporing growth occupying the remainder of the culture. Carefully selected spores from the densely sporing bands produced colonies at first retaining the same character, but the feebly sporulating type of mycelium then developed near the centre and grew outwards in sectors, finally surrounding the area of dense sporulation; submerged spores were again numerous in the sectors. Occasionally densely sporing areas, bearing the spores in chains, as is characteristic of the form-genus *Alternaria*, were found in the dilution plates, and subcultures from this sporulation type have for seven generations produced some colonies in which the *Alternaria* type, associated with abnormal development of submerged hyphae, persisted. Single-spore cultures from these colonies gave sectors of *Stemphylium* growing out from the *Alternaria* type of growth [cf. *R.A.M.*, ix, p. 411].

Preliminary experiments indicated that the slower growing and densely sporulating mycelium is more sensitive to the staling products accumulating in the culture media than the other type, and that the spores produced by it have a lower capacity for germination than those of the latter.

MITRA (M.). **Saltation in the genus Helminthosporium.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 115–127, 1 pl., 3 figs., 1931.

Continued study [details of which are given] of the eight forms of *Helminthosporium* described by the author in a previous paper [*R.A.M.*, x, p. 758] showed that six of them produced saltants in pure culture, 48 of which were isolated and investigated. Most of the saltants arose as isolated patches scattered over the surface of the parent culture, occurring most frequently in old cultures, on rich media, and in cultures maintained at about the optimum temperature for growth; new strains also arose sometimes as visible sectors which formed by preference in shallow places on the plates.

The results of the work indicated that the macroscopic characters (including intensity of sporulation) of the organisms are extremely variable, to a degree depriving them of any real taxonomic value. Although dimensions and septation of the spores vary considerably, most of the saltants resemble the parent forms in these characters; the shape and colour of the spores are fairly constant. Preliminary experiments tended to indicate that the saltants of *H. sativum* also vary within a wide range in their parasitic vigour.

QUANJER (H. M.). **Die Autonomie der phytopathogenen Virusarten.** [The autonomy of the phytopathogenic species of virus.]—*Phytopath. Zeitschr.*, iv, 2, pp. 205–224, 2 figs., 1931.

The writer here recapitulates and assembles his views previously noticed on the nature of the phytopathogenic viruses, with special reference to those affecting potatoes [*R.A.M.*, x, p. 745]. In his opinion, the attempt to unite the virus diseases and the necrotic tissue changes typifying them under a collective heading, such as the hypothetical *Plasmodiophora solani* [ibid., ix, p. 799], is opposed to the autonomous character of the phytopathogenic viruses, numerous proofs of which are here adduced.

SMITH (K. M.). **On the composite nature of certain Potato virus diseases of the mosaic group as revealed by the use of plant indicators and selective methods of transmission.**—*Proc. Roy. Soc. London*, Ser. B., cix, B762, pp. 251–267, 4 pl., 1931.

This is a detailed account of the technique used by the author [already briefly indicated in a previous paper: *R.A.M.*, x, p. 615] for the isolation of two viruses, *x* and *y*, from a symptomless streak carrier potato (Up-to-Date), and also of their reactions on a selected range of Solanaceous plants. In discussing the results obtained the author states that while the aphid-borne virus *y* appears to be a constant entity not liable to fluctuations in virulence, the virus *x* varies and produces several symptoms, e.g., a faint mottle, a type of veinbanding, and rings of different kinds.

In his opinion the different symptoms exhibited by the various mosaic diseases are due to strains of the *x* virus rather than to different viruses. There is little doubt of the almost universal occurrence of the *y* virus in potato virus diseases of the mosaic group, and in this respect it rivals the American 'healthy potato virus' except that it is usually associated with symptoms of the crinkle type. So far the *y* virus has been obtained from 20 examples of the potato diseases, mosaic, crinkle, and streak. In the field it has been found, apparently alone, causing a crinkle or mosaic in President, Arran Victory, and Epicure, while alone or in combination with the other virus it causes symptoms of leaf-drop streak in Up-to-Date. The *x* virus is widespread and in varying degrees of virulence has been found on many occasions in nature.

COTTIER (W.). **The transmission of virus diseases of the Potato by insects.**—*New Zealand Journ. of Sci. and Techn.*, xiii, 2, pp. 85–95, 7 figs., 1931.

Details are given of the writer's experiments under controlled conditions at the Plant Research Station, Palmerston North, to determine which of the common New Zealand insects are concerned in the transmission of potato leaf roll. Those used in the tests were *Myzus persicae, M. pseudosolani, Macrosiphum gei, Erythroneura zealandica, Thrips tabaci,* and *Melanophthalma gibbosa,* of

which only the first-named transmitted the disease (in 60 per cent. of the transferences made) [cf. *R.A.M.*, xi, p. 200].

MAGEE (C. J.). **Virus diseases of Potatoes. Control methods for tableland growers.**—*Agric. Gaz. New South Wales,* xlii, 11, pp. 839–841, 1 fig., 1931.

In this brief, popular note the author gives some recommendations for the establishment of stud plots for the production of potato seed tubers free from virus diseases [cf. *R.A.M.*, ix, p. 332 ; x, p. 681]. Especial stress is laid on the necessity of a careful selection of the seed tubers, which should be sprouted in the dark, so as to eliminate all tubers producing weak, elongated shoots.

ADAM (D. B.). **Degeneration of Potatoes. Virus diseases and their control.**—*Journ. Dept. Agric. Victoria,* xxx, 1, pp. 7–11, 5 figs., 1932.

In this popular note the author briefly discusses the facts supporting the view that 'degeneration' in potato stocks is due to virus diseases, and broadly indicates the lines on which such diseases may be controlled, with particular reference to the establishment of special stations in districts comparatively free from insect vectors for breeding disease-free stocks [see preceding abstract].

MARX (T.) & MERKENSCHLAGER (F.). **Zur Biologie der Kartoffel. 12. Mitteilung. Beobachtungen und Untersuchungen über den Verlauf des Kartoffelabbaues.** [On the biology of the Potato. Note 12. Observations and investigations on the course of Potato degeneration.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 5, pp. 413–492, 15 figs., 2 diags., 3 graphs, 2 maps, 1932.

The present contribution to the biology of the potato consists of an exhaustive discussion, supplemented by fully tabulated chemical analyses and statistical data, on the course of 'ecological' degeneration on different types of soil at Dahlem, Berlin [*R.A.M.*, x, p. 748]. The writers were assisted in the work by O. Schwarz, A. Hey, and M. Klinkowski.

The Industrie variety on the so-called 'Dahlem degeneration soil' is liable to develop symptoms formerly known by the name of 'raspberry disease' [cf. ibid., vii, p. 662], but for which the term 'gooseflesh', suggested by Dr. Köhler, is now preferred. Affected plants present a 'cowering' aspect, the leaf blades being drawn downwards at the tip and of an abnormal shade of green, possibly due to irregular distribution of the chlorophyll grains, while the internodes are shortened. Some plants supplied by Prof. K. O. Müller showed a spoon-shaped, drooping foliage (with downward curling of the leaf blades) together with the pathological turgor and incapacity for normal wilting associated with leaf roll. For this phenomenon the name of 'spoon disease' is proposed.

Studies on the biochemistry of 'degenerate' tubers indicated that the co-operative working of the enzymatic system as a whole

is superseded in the diseases under discussion by an unchecked functioning of the single parts, e.g., the formation of melanin by tyrosinase [ibid., viii, p. 598] and of sugar by diastase.

MUSKETT (A. E.) & CAIRNS (H.). **The control of ordinary or late blight of the Potato in Northern Ireland. I. Spraying versus dusting—further experiments.**—*Journ. Min. Agric. Northern Ireland*, iii, pp. 117–123, 2 figs., 1 plan, 1931.

In further investigations conducted in Northern Ireland in 1930 on the control of potato blight (*Phytophthora infestans*) by various fungicides [*R.A.M.*, viii, p. 736] the efficacy of four proprietary dusts and one spray fluid was compared with that of Burgundy mixture.

'Cuprite' [ibid., x, p. 371], a British made dust stated to contain 16 per cent. metallic copper, was applied with a Torpille double action powder spraying machine (1930 model) at the maximum amount recommended, viz., 20 lb. per acre. A second dust, 'copper hydrate,' stated to contain 20 per cent. metallic copper was applied by means of the same machine, but as the maximum amount recommended, 12½ lb. per acre, was too small to be applied with accuracy, 16 lb. were used, this being the least quantity which could conveniently be applied to an acre. The two remaining dusts used were the American made Niagara copper and lime dusts, D 6 and D 25, of which the former, containing the lesser amount of copper, was stated to be suitable for ordinary conditions, while the latter was intended for use during severe infection. Both were applied with a Niagara blower gun operated by hand, the first treatment being given at the rate of 25 lb. per acre, and the second and third applications at 30 lb. The British made concentrated copper spray fluid, 'bouisol' [ibid., xi, p. 194] had the properties of a colloidal Bordeaux mixture; it was applied with a Vermorel knapsack sprayer at the strength recommended, viz., 1 in 100, and at the rate of 120 galls. per acre. The Burgundy mixture was used at the 4–5–40 strength for the first application and at 8–10–40 for the remaining two applications and was applied by means of a Vermorel knapsack sprayer at the rate of 120 galls. per acre. Each plot was sprayed or dusted three times, on 8th or 9th and 29th or 30th July and on 11th August.

By 18th August, the haulms in the control plots were almost completely killed, those in the dusted plots were nearly as bad, those in the bouisol-sprayed plot were slightly better and those in the plot sprayed with Burgundy mixture were still quite green. Ten days later, the haulms in the control and dusted plots were dead, those in the plot sprayed with bouisol were not quite dead, and those which had received the Burgundy mixture were still green, but ripening off. Finally, the Burgundy mixture gave an increased yield over the control of nearly 2 tons per acre, bouisol an increase of nearly 1½ tons per acre, the copper hydrate about 19 cwt., D 25 13 cwt., cuprite 3 cwt., and D 6 1 cwt.

The cost of the materials necessary to prepare sufficient Burgundy mixture to spray one acre three times was 15*s*., as compared with 30*s*. to 42*s*. 6*d*. (according to the brand purchased) for sufficient of any one of the dusts for the same purpose.

PITTMAN (H. A.). **Potato diseases in Western Australia. The Rhizoctonia disease and common scab.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., viii, 4, pp. 463–476, 7 figs., 1931.

This is a slightly expanded version of the author's previous account of the potato diseases recorded in Western Australia [*R.A.M.*, viii, p. 804], with special reference to the etiology and control of *Rhizoctonia* scab (*Corticium solani*) and common scab (*Actinomyces scabies*). Of interest is the statement that, according to official statistical data, the average yield of potato crops in Western Australia during the period from 1920 to 1930 was only 3·8 tons per acre; this low yield is attributed in a large measure to the prevalence in the seed tubers used by the growers of various diseases, a view which is supported by the fact that growers using Government-certified seed have obtained yields averaging from 8 to 10 tons and, in one case, reaching as much as 23 tons 7 cwt. per acre.

SMITH (F. E. V.). **The leaf diseases of Irish Potatoes in Jamaica.** —*Journ. Jamaica Agric. Soc.*, xxxv, 11, pp. 489–494, 1 pl. 1931.

This is a brief, popular account of the two leaf diseases which are stated to attack potatoes in Jamaica, namely, early blight (*Macrosporium* [*Alternaria*] *solani*), and late blight (*Phytophthora infestans*), and also of their control by means of cupric sprays, the preparation of which is briefly described.

REDDICK (D.). **Some diseases of wild Potatoes in Mexico.**— Abs. in *Phytopath.*, xxii, 1, p. 22, 1932.

Blight (*Phytophthora infestans*) was observed on *Solanum verrucosum* from the State of Morelos, Mexico [*R.A.M.*, x, p. 814]. *S. demissum* is heavily infected by rust (*Puccinia pittieriana*) [ibid., x, p. 491] at El Desierto in the Federal District. An obscure disease known as 'spot' is prevalent on several tuber-bearing species of *Solanum*.

ITO (S.) & NAGAI (M.). **On the rot-disease of the seeds and seedlings of Rice-plant caused by some aquatic fungi.**—*Journ. Fac. Agric. Hokkaido Imper. Univ.*, xxxii, 2, pp. 45–69, 4 pl., 1931.

An account is given of the writers' studies on the following fungi associated with a destructive rot of rice seeds and seedlings growing in the seed-beds in Japan: *Achlya americana*, *A. flagellata* and its variety *yezoensis*, *A. oryzae*, *Dictyuchus sterile*, *Pythiomorpha miyabeana* n. sp., and *P. oryzae* n. sp. *A. prolifera*, previously reported as an agent of decay in rice seedlings in Japan [*R.A.M.*, vii, p. 535], was not obtained in the course of the present investigations. The fungi, which were isolated from water, muddy soil, vegetable and fish manure, dead insects and earthworms, as well as from infected seeds and plants, produce very similar microscopic symptoms, forming thick, white hyphae or a cottony mass at the collar of the plumules or on the surface of the grain.

P. miyabeana is characterized by somewhat swollen hyphae, 2·5 to 4·8 μ, mostly 3 to 3·5 μ in width; lemon-shaped sporangia, 36 to 53 by 17 to 36 μ, mostly 46 to 48 by 24 to 29 μ; ellipsoidal zoospores, 8·5 to 9·5 in diameter; globular, dark yellow oogonia, 28 to 50·5 μ in diameter with a smooth, thin wall 1·8 μ thick, containing smooth, globular oospores 24 to 36 μ in diameter; clavate or oblong antheridia, attached by the apices to the oogonial wall; and globular or irregular, intercalary gemmae, nearly equal to the oogonia in size.

P. oryzae may be recognized by its swollen hyphae 3·5 to 11 μ, mostly 6 to 8 μ in width; ovoid, ellipsoidal, or elongated sporangia, 41 to 84 by 26 to 48 μ, mostly 60 to 84 by 29 to 43 μ; ellipsoidal or reniform zoospores, 12 by 7 μ; and globular or irregular, intercalary gemmae; oogonia and antheridia were not found.

The optimum temperature for the growth on cereal agar of the above-mentioned species was found to be 26° to 28° C., except *A. oryzae* which developed best at 32° to 33°. The results [which are tabulated and discussed] of inoculation experiments showed that, generally speaking, a higher percentage of infection follows the combined attack of *P. oryzae* or *P. miyabeana* with one of the other rice pathogens than where the latter occur singly. *D. sterile* in particular proved to be a weak parasite. All the fungi invaded hulled rice grains more readily than dehulled ones.

ITO (S.) & KIMURA (J.). **Studies on the 'bakanae' disease of the Rice-plant.**—*Hokkaido Agric. Exper. Stat. Rept.* 27, 99 pp., 2 pl. (1 col.), 1931. [Japanese, with English summary.]

In the Hokkaido district of Japan, where the writers' studies on the 'bakanae' disease of rice have been conducted for five years, the number of affected plants is stated frequently to reach 20 per cent. in the ordinary fields, while even in the well-cultivated plots at the Experiment Station 6,000 to 36,000 culms per acre may be attacked.

The diseased plants are tall, slender, and of a yellowish-green colour. When the affected seedlings were singly transplanted in the field, about 38 per cent. recovered before harvesting, 59 per cent. died, and 3 per cent. remained unchanged, showing the typical symptoms of the disease. Among the plants that succumbed, 51 per cent. died before the earing period. The infected plants were uniformly inferior to the healthy ones in the number of tillers, length of ears, number of grains per ear, and degree of maturity.

A species of *Fusarium* has consistently been isolated from the seedlings, culms, and grains affected by bakanae, the pale salmon-coloured sporodochia being especially visible along the suture line of the glumes. Inoculation experiments with this organism gave positive results only on rice and to a slight extent on maize, which developed a brownish discoloration of the culm base and made feeble growth, but without showing any of the typical bakanae symptoms. In Hokkaido the ascigerous form of the causal organism is produced on the affected culms in the autumn, and is freely formed in single ascospore cultures. The conidial stage was

erroneously identified with *F. heterosporium* Nees by S. Hori in 1898, and the ascigerous stage named *Lisea fujikuroi* by Sawada in 1917. In the senior author's opinion, however, the fungus is identical with, or possibly a variant of, *Gibberella moniliformis* (Sheldon) Wineland [described in 1924: ibid., iv, p. 162], having the microconidia in chains or false heads, the macroconidia mostly triseptate, no chlamydospores, and the ascospores uni-, rarely bi- or triseptate. In any case, the name *L. fujikuroi* cannot be accepted since *Lisea*, according to Wollenweber, is merely a section of *Gibberella*. Pending the results of further studies (now in progress), the name *G. fujikuroi* (Sawada) S. Ito n. comb. is proposed [but see also *G. fujikuroi* (Saw.) Wr.: ibid., x, p. 626; xi, p. 332].

The conidia germinated readily in water in five to six hours at 25° C., producing secondary conidia on the hyphae after one day. The ascospores also germinated in water in three to five hours at 25° to 26° and produced conidia after one day. Conidia were formed in profusion on various cultural media. On potato decoction and straw decoction agars and on steamed straw, indigo-black sclerotia were produced but no perithecia. The minimum, optimum, and maximum temperatures for perithecial growth were determined as about 10°, 26°, and 30°. *G. fujikuroi* survived four hours' exposure to a temperature of 95° (dry heat), being destroyed only by the same period at 100°. Suspended in water at 55°, 57·5°, and 60°, the conidia were killed in 17·5, 12·5, and 2·5 minutes, respectively, the corresponding times for the hyphae being 20, 15, and 5 minutes. The bakanae fungus was further able to withstand a few hours' exposure to a temperature of −23°. The conidia were killed by immersion in 1 to 2 per cent. formalin or 0·1 per cent. corrosive sublimate; for practical purposes 30 minutes in 2 per cent. or one hour in 1 per cent. of the former preparation is recommended. The disease was also controlled by salt water treatment (1·08 sp. gr. for non-glutinous or 1·07 sp. gr. for glutinous seeds).

The filtrate of culture solutions of the fungus produced the characteristic symptoms of the disease on rice seedlings. The hyphae were found to remain viable after three years' desiccation in the laboratory, and also survived a winter's exposure in the open, but very few survived in or on the ground and none in farmyard manure. The conidia remained alive for two years or more under dry conditions indoors.

No direct correlation could be traced between density of sowing and the severity of the bakanae disease, which was found, however, to be promoted by the presence in the seed of hulled or injured grains. In Hokkaido these are often found in considerable numbers especially after motor threshing, and their elimination is important. Infection by *G. fujikuroi* was more prevalent in transplanted than in direct sown fields. Generally speaking, the non-glutinous rice varieties appear to be somewhat more susceptible to bakanae disease than glutinous ones. Among the local varieties, Shiroke, Akage No. 3, and Kairyo-mochi No. 1 are resistant, while Bozu, Bozu No. 5, Chinko-bozu, and Iburiwase are susceptible.

KUROSAWA (E.). **Effect of temperature and medium upon the overgrowth phenomenon of Rice seedlings caused by the excretion of the cultures of Lisea fujikuroi Saw.**—*Journ. Nat. Hist. Soc. Formosa*, xxix, pp. 159–181, 1931. [Abs. in *Japanese Journ. of Botany*, vi, 1, pp. (9)–(10), 1932.]

The filtrate of cultures of *Lisea* [*Gibberella*] *fujikuroi*, the causal organism of the 'bakanae' disease of rice [see preceding abstract], is known to induce abnormal growth in length of the seedlings in the same way as the fungus itself. In some cases, however, exactly the opposite effect was observed. It was found by experiments in various nutrient media at different temperatures that abnormal growth in length occurs between 20° and 35° C., the former being the optimum, while above 35° retardation sets in. The presence of potassium or calcium nitrate and dextrose in the medium is necessary to induce the latter phenomenon, while for the former acid potassium phosphate is required in addition to the other substances.

KURIBAYASHI (K.). **Über eine Methode, um die Tatsache nachzuweisen, ob Piricularia oryzae noch lebt oder nicht.** [On a method of determining whether *Piricularia oryzae* is still viable or not.]—*Journ. Plant. Protect.*, xvii, 11 pp., 1931. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 1, p. (9), 1932.]

On treatment with a mixture of 2 per cent. neutral red and methylene blue, living conidia of *Piricularia oryzae* [*R.A.M.*, ix, p. 556] stain deep red or orange, whereas the dead ones assume a dark green coloration within five minutes. This method can also be used for *Colletotrichum lindemuthianum*, *Cercospora beticola*, and *Lisea* [*Gibberella*] *fujikuroi* [see preceding abstract].

SAMPIETRO (G.). **Il brusone. Le ipotesi vecchie e le loro contraddizioni.** ['Brusone'. Old theories and their contradictions.]—*Giorn. di Risicolt.*, xxii, 1, pp. 1–13, 1932.

In this paper (which originally appeared in the French journal *Riz et Riziculture*, v, 3), the writer discusses at some length the various theories that have been advanced from time to time in explanation of the 'brusone' disease of rice [*R.A.M.*, xi, p. 262]. None of these hypotheses has proved tenable, and the sole means of eliminating the disease appears to lie in obtaining from India, China, Japan, Java, and other rice-growing countries varieties with a high degree of congenital immunity, crosses between which and the indigenous Italian strains should yield resistant progeny.

MURRAY (R. K. S.). **Diseases of Rubber in Ceylon, 1931.**—*Fourth Quart. Circ. for 1931, Rubber Res. Scheme* (*Ceylon*), viii, 4, pp. 39–41, 1931.

On the great majority of the estates in the main low-country districts of Ceylon the most dangerous disease of *Hevea* rubber is *Fomes lignosus*, the next most important in mature areas being *Ustulina zonata*. In 1931, die-back was much in evidence on poor washed-out soils and resulted, almost invariably, primarily from lack of cultivation and of measures for the conservation of water

and surface soil. Many weakly parasitic fungi are unable to attack healthy twigs but can kill back shoots whose water or food content is reduced below a certain level.

Owing to unusually protracted wet weather during the south-west monsoon, secondary leaf fall due to *Phytophthora palmivora* was moderately severe in most districts. *Oidium* [*heveae*: *R.A.M.*, xi, p. 126] is firmly established in all districts, but only at mid-country elevations is the defoliation serious. Considerable damage was wrought by attacks of *P. palmivora* on the green shoots of nursery stock; attacks of this fungus on the woody portions of bud-shoots, causing a type of canker, were also reported.

Mildew leaf disease. Some observations.—*Malayan Tin and Rubber Journ.*, xx, 20, pp. 1233–1238, 1931.

In this paper a summary account is given of the appearance and spread of the *Hevea* rubber mildew (*Oidium heveae*) [see preceding abstract] in the eastern tropics. After a brief description of the biology of the fungus, the symptoms caused by it, and of its influence on the yield, a detailed discussion follows of the measures now in use for its control, all of which have already been noticed in this *Review* from time to time.

MURRAY (R. K. S.). **The influence of Oidium and sulphur dusting on yield and bark renewal.**—*Fourth Quart. Circ. for 1931, Rubber Res. Scheme* (*Ceylon*), viii, 4, pp. 42–51, 2 graphs, 1931.

In this report an account is given of sulphur dusting experiments for the control of mildew of *Hevea* rubber (*Oidium* [*heveae*]) carried out in 1930 and 1931 on the Kandanuwara Estate, Ceylon [see preceding abstracts]; in 1931, the dusting was even more successful than in the previous season, defoliation by the disease being largely prevented. Figures are given of the monthly yields of the test fields calculated to a standard of 100 trees tapped 12 times per month.

Owing to the retention of the young foliage, the dusted field recovered its normal yield in March and April after the usual falling off which takes place at the time of the wintering of the trees in January and February, whereas in the undusted control field the yield was still further depressed in March by abnormal defoliation of the young shoots; during the last six months of the year, however, the control field gradually recovered in yield and foliage as the severity of the attack abated. In both years the dusting was discontinued in March, and during the next following months there was a severe secondary mildew attack on the mature leaflets, which, however, caused little actual defoliation, in the treated field.

From March to December, 1930, the total yield for 100 trees of the dusted field amounted to 377·5 lb., as compared with 327 lb. in the control, the corresponding figures for the same period a year later being 464 and 298·5. The dusting not only conferred lasting benefit on the well-being of the trees, but provoked an immediately favourable effect on the yield.

In 1931 the average yield per tree per tapping in the dusted field

increased over that obtained in 1930 by 0·06 oz., whereas the yield in the control field decreased by 0·11 oz., these figures amounting to a net increase of the dusted over the undusted field of 0·17 oz. per tree per tapping; in other words, in 1930 the yield of the dusted plot was 16 per cent. greater than that of the controls, whereas in 1931 it had risen to be 75 per cent. greater. In the former year the dusting was started too late and a total of only 53 lb. sulphur per acre was used, against 85 lb. in 1931.

A comparison of the estimated yield per acre of the dusted field (calculated from the plot yields and the known number of trees per acre) with the yields per acre in previous years (taken from the estate figures) demonstrated that the dusting had brought about a net increase of roughly 200 lb. per acre per annum.

The average thickness of 8 months' renewing bark was about 39 per cent. greater in the dusted than in the control field.

CORNER (E. J. H.). **The identity of the fungus causing wet-root rot of Rubber trees in Malaya.**—*Journ. Rubber Res. Inst. Malaya*, iii, 2, pp. 120–123, 2 pl., 1931.

The author states that careful comparison of material from the Kew Herbarium, the Buitenzorg Botanic Gardens, and from Malaya allowed him to confirm beyond doubt the identity of the fungus causing wet-root rot of *Hevea* rubber in Malaya with the 'roode wortelschimmel' (*Ganoderma pseudoferreum*) of Java [*R.A.M.*, ix, pp. 127, 740; xi, p. 72]. This fungus has been found as a parasite at the base of several large forest trees in Johore and Pahang, and on *Myristica*, *Pterocarpus*, and *Arenga saccharifera* in Singapore. The species is very close to *G. applanatum*, of which it may eventually prove to be a variety. The paper terminates with an English description of the fungus, based on the Malayan material seen by the author, which is stated to agree exactly with that of van Overeem and Steinmann.

NAPPER (R. P. N.). **A further note on the effects of fungicides on the viability of Hevea buds.**—*Journ. Rubber Res. Inst. Malaya*, iii, 2, pp. 114–119, 1931.

The experiments briefly described in this paper showed that *Hevea* rubber buds taken from clone Avros 50 are much more susceptible to injury from immersion in copper sulphate solutions than those of a local Ceylon clone known as G. 771. These results are considered to explain the fact that while in Ceylon the disinfection of *Hevea* rubber cuttings and budded stumps with copper sulphate was reported as safe, in Malaya it was shown to be unsatisfactory, inasmuch as it seriously injured or even killed the buds [*R.A.M.*, x, p. 686].

JONES (W.). **A new technique for obtaining oospores of the Hop downy mildew by inoculating cotyledons.**—*Science*, N.S., lxxv, 1934, p. 108, 1932.

Hop seeds were gathered from plants badly infected by downy mildew (*Pseudoperonospora humuli*) in the Fraser Valley, British Columbia [*R.A.M.*, ix, p. 677], in 1930, and sown in the laboratory in 1931. As the cotyledons and young primary leaves appeared,

they were inoculated, after moistening, by placing on them fragments of infected leaves from diseased 'basal spikes' [ibid., v, p. 639], and then covered with vials in order to maintain maximum humidity. The temperature remained fairly constant at 58° to 65° F. After six days the cotyledons showed signs of 'damping-off', and on teasing out the tissue, about 80 oospores, from 23 to 37 μ in diameter, were found in each cotyledon. When maximum humidity was not maintained, conidiophores bearing conidia were also produced. It is now possible to obtain abundant oospore material by inoculating hop seedling cotyledons in this manner and gathering them on the first signs of damping-off. Conidia for experimental use in the greenhouse during the winter may also be obtained by the method herein described.

ASHBY (S. F.). **Quarantine and the spread of Sugar-Cane diseases.**—*Rept. Proc. Imper. Sugar-Cane Res. Conf., London, 1931*, pp. 146–151, London, Empire Marketing Board, 1932.

Notes are given on the present known distribution of the six major sugar-cane diseases, viz., mosaic [*R.A.M.*, xi, p. 265], Fiji disease [ibid., xi, p. 327], sereh [ibid., x, p. 299], gumming (*Bacterium vascularum*), leaf scald (*Bact. albilineans*), and leaf stripe (*Sclerospora sacchari*) [ibid., x, p. 690]. A brief discussion is given of the problem of latent or dormant infection, together with an account of modern methods of quarantine and a statement concerning the introduction of true seed.

ROLDAN (E. F.). **Pokkah-boeng, a disease of Sugar-Cane found on a Java Cane variety in the Philippine Islands.**—*Philipp. Agric.*, xx, 8, pp. 526–529, 2 figs., 1932.

On a recent visit to Del Carmen, Pampanga, infection with pokkah-boeng was again found on the P.O.J. 2878 sugar-cane variety [*R.A.M.*, xi, pp. 203, 266, 327], and it is feared that the disease [the symptoms and history of which are briefly described] may gain a foothold in the Islands unless prompt measures for its suppression are adopted. A species of *Fusarium* was consistently isolated from diseased canes and studies are in progress to determine its relationship with *F. moniliforme* [*Gibberella moniliformis*].

KARLING (J. S.). **Studies in the Chytridiales VII. The organization of the Chytrid thallus.**—*Amer. Journ. of Botany*, xix, 1, pp. 41–74, 21 figs., 1932.

In this study the writer discusses the distinguishing features of the thallus in the Rhizidiaceae, Myxochytridineae, and Cladochytriaceae.

The rhizoids of the family Rhizidiaceae are in general distinguishable from the mycelium of the higher fungi by their decrease in diameter from the point of origin and tapering to fine tips without any tendency to form new centres for the processes of growth, differentiation, and reduction. The thallus in the Cladochytriaceae is designated as a rhizomycelium to distinguish it from the mycelium of the higher fungi and the rhizoidal system of the Rhizidiaceae. In the genera *Physoderma* and *Urophlyctis*, and to some

extent in *Cladochytrium*, the turbinate organs or 'collecting cells' appear to be the centres of reduplication, from which the thallus spreads in the host tissue. At maturity, numerous centres of growth and differentiation arise in the form of sporangia and resting spores, with the result that the thallus becomes a polygenocentric system, in contrast to the monogenocentric thallus of the Rhizidiaceae.

A bibliography of 64 titles is appended.

ARNAUD (G.). **Les Astérinées. VII.** [The Asterineae. VII.]—*Ann. de Cryptog. exot.*, iv, 2, pp. 74–97, 6 pl., 1931.

In this paper the author gives a general review of the classification of the Asterineae in the broad sense, as employed by him in his previous communications [*R.A.M.*, x, p. 753 *et passim*]. This is followed by a description and discussion of several species belonging to this group of fungi from the Hawaiian Islands.

VAN BEYMA THOE KINGMA (F. H.). **Untersuchungen über Russtau.** [Investigations on sooty moulds.]—*Verh. Koninkl. Akad. Wetensch. Amsterdam,* Sect. 2, xxix, 2, pp. 1–29, 4 pl., 1931.

The present investigations on the sooty moulds were restricted to the study in culture of some imperfect forms, including *Caldariomyces fumago* Woronichin (*Fumago vagans* Pers.), which produced stalked and sessile pycnidia containing immense numbers of hyaline, elongated-spherical to oval, continuous pycnospores of very variable dimensions (mainly 4 to 11 by 2·3 to 5·3 μ), with 1 to 3 or more large oil drops. Conidia are not formed.

Two sooty moulds of tea from Java [*R.A.M.*, x, p. 558] are named *Microxyphium purpuraefaciens* n. sp. and *M. theae* n. sp. In the cultures of these also no conidial forms were observed but only stalked or sessile pycnidia in dense fascicles, measuring 200 to 350 by 30 to 80 μ in the former species and 400 to 500 by 50 to 95 μ (stalked) or 44 to 104 by 32 to 66 μ (sessile) in the latter; the neck in *M. purpuraefaciens* measures 140 to 175 μ in length and in *M. theae* 225 to 375 by 13 to 20 μ. The hyaline, continuous, mostly biguttulate pycnospores of *M. purpuraefaciens* measure 3·7 to 4 by 2·3 to 2·7 μ (average 4 by 2·3 μ), while those of *M. theae* are elliptical or oval in the stalked pycnidia and measure 3 to 3·7 by 2 μ, and spherical in the sessile, measuring 2·3 to 2·7 μ in diameter.

A comparison is given between the three forms under discussion.

JACKSON (H. S.). **The rusts of South America based on the Holway collections. V.**—*Mycologia,* xxiii, 6, pp. 463–503, 1931.

Continuing his studies of South American rusts [*R.A.M.*, xi, p. 128] the author gives notes on 83 species (including one new genus, 24 new species, and 4 new combinations) which occur on 24 families of phanerogams, including representatives of the Euphorbiaceae, Vitaceae, Tiliaceae, Malvaceae, Cactaceae, and Umbelliferae. English diagnoses of the new species are appended.

CUMMINS (G. B.). **Phragmidium species of North America: differential teliospore and aecial characters.**—*Mycologia*, xxiii, 6, pp. 433–445, 1 pl., 1931.

A discussion is given of the differential characters shown by the teleuto- and aecidiospores of 19 North American species of *Phragmidium*, by means of which these fungi are divided into two sections, namely, *Earlea* including six species, and *Euphragmidium* with thirteen species. The paper also gives a key to these species, arranged by the three tribes of the Rosaceae on which they occur.

HIRATSUKA (N.). **Inoculation experiments with some heteroecious species of the Melampsoraceae in Japan.**—*Japanese Journ. of Botany*, vi, 1, pp. 1–33, 1932.

A detailed account, supplemented by 42 tables, is given of the writer's inoculation experiments, covering a period of eight years, with some heteroecious species of Melampsoraceae occurring in Japan [*R.A.M.*, vii, p. 405; ix, p. 205].

In tables 41 and 42 the results of the experimental data are completely summarized, separate columns being allotted to the rust, the material used as inoculum, the experimental host, the investigator, year of investigation, and the natural hosts of the aecidial, uredo, and teleuto stages.

CURZI (M.). **Alcuni casi di 'cancrena pedale' da 'Sclerotium' osservati in Italia.** [Some cases of 'foot canker' caused by '*Sclerotium*' observed in Italy.]—*Rendic. R. Accad. Lincei*, xiv, Ser. VI, 5–6, pp. 233–236, 1 fig., 1931.

In 1929, asters growing at Pisa were affected by a rot [the symptoms of which are described] extending from the roots to the collar and for a few centimetres along the stem above the surface of the ground. From the affected plants the author isolated a fungus which in culture developed an abundant aerial flocculent mycelium with numerous cream-coloured, later dark chestnut, smooth, globose sclerotia about 0·5 to 1·5 mm. in diameter. This organism agreed in all its morphological characters with *Sclerotium rolfsii*, corresponding not only to Saccardo's diagnosis but to most of the detailed descriptions published by American workers.

In certain [not specified] cultural conditions the perfect or *Corticium* stage developed [cf. *R.A.M.*, vi, p. 56; x, p. 344], characterized by densely intricate branched hyphae bearing at the extremity clavate basidia measuring 10 to 15 by 4 to 5 μ, with 2 to 4 sterigmata 4 to 5 μ long, and with smooth, oval, hyaline basidiospores measuring 5 to 7 by 2·5 to 3·75 μ. Miss Westerdijk having informed the author that Nakata's and Goto's organisms [loc. cit.] corresponded to *S. delphinii* rather than *S. rolfsii*, he considers that he is the first to have obtained the perfect stage of Saccardo's species.

Another strain of *Sclerotium* was noted by the author in May, 1930, causing a basal canker of the stems of potatoes near Rome. In culture growth was more rapid than was the case with the aster strain and the colonies were occasionally dendritic; aerial

mycelium was sometimes absent, sometimes abundant and loose; the sclerotia were larger than those of *S. rolfsii* from aster, varied in size, and sometimes had dark, depressed spots on the surface. The fungus had many of the characters of *S. rolfsii* and some (less marked and less constant) of those of *S. delphinii*. While it could be regarded as an intermediate strain between the two species, it was nearer to *S. rolfsii*, to which the author considers it should be referred.

In some cultures of the strain obtained from potato, hymenial plaques of *Corticium* developed, showing well-formed, mature fertile organs almost identical with, though slightly larger than, those of the strain isolated from aster.

BEALE (HELEN PURDY). **Specificity of the precipitin reaction in Tobacco mosaic disease.**—*Contrib. Boyce Thompson Inst.*, iii, 4, pp. 529–539, 1931.

Leaf extracts of Sudan grass (*Andropogon sorghum* var. *sudanensis*), *Hippeastrum equestre*, lily (*Lilium* spp.), and *Abutilon striatum* var. *thompsoni*, each affected by its respective mosaic disease, and of peach affected by yellows, were tested for their ability to precipitate the antiserum for tobacco mosaic virus, with negative results [*R.A.M.*, viii, p. 743; x, p. 563].

Nicotiana glutinosa, *N. rustica*, and *Martynia louisiana* were added to the list of hosts of tobacco mosaic virus previously tested with antiserum for the same virus in Turkish tobacco, with a view to determining the presence or absence of material reacting with the specific precipitins, with positive results in every case.

The viruses of ring spot and cucumber mosaic [ibid., xi, p. 344] were multiplied in Turkish tobacco, and leaf extracts of the affected plants were used in turn as antigens in precipitin tests with antiserum for tobacco mosaic virus extract of Turkish tobacco. A slight precipitation resulted in the tubes containing undiluted antiserum and virus extract such as occurs when juice from healthy tobacco is used with undiluted antiserum. No specific precipitate for virus extracts of tobacco affected by ring spot or cucumber mosaic was demonstrable.

The author's results are considered to favour the interpretation that the specific antigenic substance in the virus extract of tobacco mosaic is foreign antigenic material, possibly virus itself, rather than altered host protein.

VINSON (C. G.) & GILDEHAUS (E. J.). **Comparison of juices from diseased and healthy Tobacco plants.**—Abs. in *Phytopath.*, xxii, 1, p. 29, 1932.

The tobacco mosaic virus can be precipitated from the juice of diseased plants by the addition of a solution of lead acetate [*R.A.M.*, x, p. 761]. After washing the precipitate with a M/3 solution of primary potassium ortho-phosphate, the virus can be freed from the precipitate by means of a dilute solution of potassium hydrogen phosphate, the reaction of which is nearly neutral. Such a solution of the virus is very infectious and contains Kjeldahl nitrogen, which is absent from a solution of healthy plant juice.

VINSON (C. G.). **Decomposition of the safranin precipitate of mosaic virus of Tobacco.**—Abs. in *Phytopath.*, xxii, 1, p. 29, 1932.

The safranin precipitate of the tobacco mosaic virus [*R.A.M.*, viii, p. 407] has been satisfactorily decomposed by the addition of Lloyd's alkaloidal reagent. The mixture is agitated at intervals for about 30 minutes and then centrifuged at high speed. After the removal of the safranin the supernatant liquid is usually more highly infectious than the original juice from which the safranin precipitate is prepared.

WAUGH (J. G.) & VINSON (C. G.). **Particle size of the virus of Tobacco mosaic in purified solutions.**—Abs. in *Phytopath.*, xxii, 1, p. 29, 1932.

The results of preliminary experiments indicate that the radius of the tobacco mosaic virus particle in purified solutions is less than 5 $\mu\mu$ [cf. *R.A.M.*, xi, p. 256].

VALLEAU (W. D.). **Two seed-transmitted ring-spot diseases of Tobacco.**—Abs. in *Phytopath.*, xxii, 1, p. 28, 1932.

Both the green and yellow ring spots occurring on tobacco in Kentucky [*R.A.M.*, x, p. 411] have been found to be transmissible through the seed in percentages up to 15. Seedlings affected by yellow ring spot turn yellow soon after germination. Of 24,060 seedlings raised from plants affected by yellow ring spot, 1,175 or 4·9 per cent. showed positive infection a few days after germination. Seed transmission of green ring spot is difficult to detect except at low temperatures (50° to 65° F.), when the leaf margins of affected plants become chlorotic or necrotic. The flower parts of affected plants appear normal, but most of the pollen grains are rather small and sterile, a feature that may be useful for diagnostic purposes in the absence of other symptoms.

TISDALE (W. B.). **Development of strains of cigar wrapper Tobacco resistant to blackshank (Phytophthora nicotianae Breda de Haan).**—*Florida Agric. Exper. Stat. Bull.* 226, 45 pp., 12 figs., 1931.

Further trials have been conducted in Florida in the attempt to develop tobacco varieties resistant to black shank (*Phytophthora nicotianae*) [*R.A.M.*, ix, p. 211]. The blossoms were protected from cross-pollination by covering the inflorescence with a sulphite paper bag until the seed reached maturity. Seed from each self- or cross-pollinated plant was saved separately and planted the following season on a steam-sterilized bed. Seedlings from each lot were transplanted to thoroughly infested soil in adjacent rows. Seed of the best plants from the most resistant rows was again saved and the process repeated until a highly resistant strain was developed.

The P strain thus obtained is a resistant selection from Big Cuba, the main commercial variety of cigar wrapper tobacco grown under shade in Florida up to 1923. Resistant strains have been similarly developed from the Little Cuba, Dubek (Russia), and Santiago (Java). Number 1 is a new resistant strain arising from

a cross between a partially resistant strain of Big Cuba and the susceptible Connecticut Round Tip. The new resistant strain R was developed from a suspected cross between a resistant strain of Big Cuba and Connecticut Round Tip. Number 301 was developed from a cross between resistant Big Cuba and resistant Little Cuba. This strain has given satisfactory results in two years' tests on an extensive commercial scale. Number 94, which was developed from a cross between 301 and R, gives a very superior quality of cured leaf. The P, 301, and 94 strains have been released for commercial cultivation.

ADAM (D. B.). **Blue mould in Tobacco. Hints on its control.**—*Journ. Dept. Agric. Victoria*, xxix, 10, pp. 469–471 and 476, 3 figs., 1931.

This is a brief popular discussion of the sources of infection of tobacco seed-beds with the blue mould fungus [*Peronospora* sp.: *R.A.M.*, x, p. 492; xi, p. 76], and of the control measures against it, including the preparation and application of Bordeaux mixture.

KUNKEL (L. O.). **Local lesions in aucuba mosaic of Tomato.**—Abs. in *Phytopath.*, xxii, 1, p. 16, 1932.

Studies on aucuba or yellow mosaic of tomato material obtained from England [*R.A.M.*, x, p. 135; xi, p. 335] have shown that the virus of this disease produces necrotic local lesions in leaves of the following species and varieties of *Nicotiana*: *N. acuminata*, *N. alata*, *N. glutinosa*, *N. langsdorffii*, *N. rusbyi*, *N. rustica*, *N. suaveolens*, *N. sylvestris*, and the Adcock, Burley, and Little Oronoca varieties of *N. tabacum*. It produces chlorotic local lesions in the following species and varieties: *N. paniculata* and *N. tabacum* vars. *macrophylla*, *purpurea*, and Connecticut Seed Leaf. The aucuba mosaic virus further produces chlorotic local lesions in the leaves of 12 tomato varieties [which are enumerated], including Globe, John Baer, and Stirling Castle. The development of local lesions is associated with multiplication of the virus at the point of inoculation. Aucuba mosaic differs from ordinary tobacco mosaic in its capacity to produce local lesions in tomato and in certain species and varieties of *Nicotiana*.

ALEXANDER (L. J.), YOUNG (H. C.), & KIGER (C. M.). **The causes and control of damping-off of Tomato seedlings.**—*Ohio Agric. Exper. Stat. Bull.* 496, 38 pp., 6 figs., 3 graphs, 1931.

Pythium ultimum [*R.A.M.*, x, p. 569; xi, p. 330] and *Corticium vagum* var. *solani* [*C. solani*] have been found to cause serious damping-off of tomato seedlings in seed-beds in Ohio, the former organism being responsible for most of the damage. The symptoms produced by both fungi are similar, except that *C. solani* causes malformations of the cotyledons and a drier type of lesion than that due to *P. ultimum*. The latter was found, in the conditions tested, to be least destructive at a soil temperature of 30° C. in soil at 35 per cent. of its water-holding capacity and to cause most injury between 18° and 24° at 45 per cent. soil moisture. *C. solani* caused the greatest reduction of emergence at 24° and the highest percentage of damping-off at 27° to 30° with water-holding capaci-

ties above 35 per cent. Excellent control of the disease in sterilized soil artificially inoculated with *P. ultimum* and *C. solani* was given by the admixture of a dust prepared by absorbing 15 parts by weight of 40 per cent. commercial formaldehyde on 85 parts of a carrier consisting of 1 part of kaolin and 2 parts of diatomaceous earth, at the rate of 42 gm. per sq. ft. of soil $2\frac{1}{2}$ to 3 inches deep. Immediately after treatment the seed was sown and the soil thoroughly watered.

NEWHALL (A. G.). **A greenhouse Tomato hybrid somewhat resistant to Cladosporium leaf mould.**—Abs. in *Phytopath.*, xxii, 1, pp. 20–21, 1932.

In crosses between the English tomato varieties, Satisfaction and Main Crop, which show considerable resistance to leaf mould (*Cladosporium*) [*fulvum*: *R.A.M.*, vii, p. 749] and the standard American varieties, Bonny Best, and a pink Marglobe (Marhio), susceptibility was dominant in the F_1 generation. Seedlings of the F_2 generation were inoculated and the susceptible ones discarded, while some of the resistant individuals were grown to maturity and yielded 5 to 12 lb. per plant. Some resistance to leaf mould in the greenhouse under New York conditions appears to have persisted in the F_3, F_4, and F_5 generations of these crosses.

La maladie et les ennemis des Ormes. [The disease and enemies of Elms.]—*Rev. zool. agric. et appl.* (Bordeaux), xxx, 3, pp. 41–47, 1931. [Abs. in *Rev. Appl. Entomol.*, Ser. A, xx, 1, pp. 46–47, 1932.]

Of the elm sap beetles associated with Dutch elm disease (*Graphium ulmi*), *Scolytus* (*Eccoptogaster*) *scolytus* [*R.A.M.*, xi, pp. 275, 337] has two generations annually, the adults appearing in May and the latter half of August. *S.* (*E.*) *multistriatus* has similar habits, but attacks the smaller branches. Dying trees should be cut down, and the bark immediately removed from the trunk and large branches and burnt, together with all the smaller branches. Elms defoliated by *Galerucella* (*Galeruca*) *luteola* are so weakened that they are particularly subject to attack by Scolytids, and hence to infection by *G. ulmi.* Collection of the adults and larvae is advised.

BUISMAN (CHRISTINE). **Ceratostomella ulmi, de geschlachtelijke vorm van Graphium ulmi Schwarz.** [*Ceratostomella ulmi*, the sexual stage of *Graphium ulmi* Schwarz.]—*Tijdschr. over Plantenziekten*, xxxviii, 1, pp. 1–5, 3 pl., 1932. [English summary.]

Graphium ulmi, the causal organism of the die-back of elms [see preceding abstract], has been found by the writer to consist of two heterothallic groups (+ and − strains). By growing both strains together on sterilized elm twigs it is possible to produce perithecia of the *Ceratostomella* type approximating to those of *C. pini* [*R.A.M.*, xi, p. 340] but differing from the latter in their longer necks. The perfect stage of *G. ulmi* is accordingly named *C. ulmi* n. sp. It was obtained from branches of elms artificially inoculated with two isolations of the fungus and also by growing

different pure cultures of the fungus together on sterilized elm twigs.

The perithecia, which have not yet been found in nature, are black, round, 105 to 135 μ (average 123 μ) in diameter, generally provided with a few scattered hairs; the necks are often slightly curved, 265 to 380 μ in length, 24 to 38 μ wide at the base, 10 to 16 μ at the top, where the hyphae composing the neck diverge to form a crown of some 24 septate cilia of variable length (usually 25 to 60 μ), sometimes swollen at the top. The asci are embedded in a slimy mass and disintegrate in water, so that accurate determination of their size and the number of ascospores is difficult. The ascospores (of which there are probably eight per ascus) are slightly curved, shaped like the segments of an orange, and measure 4·5 to 6 by 1·5 μ.

RANKIN (W. H.). **A new disease of Elm.**—*Seventh Nat. Shade Tree Conf., Proc. Ann. Meeting, August 27, 28, 29, 1931*, pp. 79–82, 1931.

In the summer of 1931 about 10 per cent. of the total number of five- to ten-year-old dwarf Asiatic elm (*Ulmus pumila*) trees in a neglected nursery block near Geneva, New York, showed a conspicuous mottling of the leaves, the light green areas becoming more yellowish as the season advanced. In some cases the first leaves were more mottled than the later ones, while in others the apical leaves of the twigs became entirely yellow. Two Scotch elms (*U. glabra*) in the same block showed such pronounced distortion of the foliage that the trees were barely recognizable as elms. The leaves were ragged and streaked with light green dashes or long lines here and there. These symptoms are considered to be strongly suggestive of a virus disease, in which case this would be the first record of a disease of this class on shade trees. A similar condition is stated to have been observed on elms in the Hudson Valley and New Jersey.

EHRLICH (J.). **The occurrence in the United States of Cryptococcus fagi (Baer) Dougl., the insect factor in a menacing disease of Beech.**—*Journ. Arnold Arboretum*, xiii, 1, pp. 75–80, 1932.

The beech scale of Europe (*Cryptococcus fagi*), which has been spreading in eastern Canada for many years, has recently been found in large numbers on beeches in Massachusetts and Maine. In Nova Scotia, Faull observed that the beech trees which are dying in quantities were suffering from the attacks of [unspecified] fungi growing in the scale-infested bark [*R.A.M.*, ix, p. 421], but the fungi have not yet been found in the United States. Notes are given on the life-history and control of the insect, which does not seem to be a serious pest unless accompanied by fungi that gain entry through bark injured by the scale.

ASHCROFT (J. M.). **Canker of Black Walnut caused by a Nectria sp.**—Abs. in *Phytopath.*, xxii, 1, p. 3, 1932.

Black walnut [*Juglans nigra*] canker, associated with a species

of *Nectria* closely resembling *N. ditissima* [? *N. galligena*: *R.A.M.*, ix, p. 751], has been found in West Virginia, Pennsylvania, and Virginia, and reported from Rhode Island, Wisconsin, Tennessee, North Carolina, and Ontario. Out of 104 inoculations made with conidial suspensions of the fungus on the wounded bark of old and young black walnut trees, 79 per cent. were successful. The *Nectria* was repeatedly reisolated from the artificially induced cankers. The typical ringed aspect of the cankers is due to a seasonal alternation of dominance in the growth of the fungus and that of the host, the activity of the former being conspicuous in the late winter and early spring. All the regions of the trunk are liable to infection.

WHITE (R. P.). **Four unusual symptomatic pictures and their diagnosis.**—*Seventh Nat. Shade Tree Conf., Proc. Ann. Meeting, August 27, 28, 29, 1931*, pp. 82–86, 1931.

A brief, popular account is given of four unusual pathogenic conditions of trees in New Jersey. Two Norway maples (*Acer*) [*platanoides*] were attacked by *Armillaria mellea*, causing a reddish discoloration of the foliage and a water-soaked decay of the bark near the soil level. The same fungus has been found during 1931 killing *Buxus suffruticosa* and *Andromeda japonica* plants.

Another Norway maple showed an extensive development of fibrous roots growing upwards from the base of the trunk, instead of downwards, and thereby causing a loosening of the bark from the phloem. A slight slime flux was present near the affected area, but the primary cause of the condition is obscure.

A disease of Japanese maples [*A. palmatum*] at present undergoing investigation at the New Jersey Experiment Station is characterized by a silvery, shrunken appearance of single branches, which are killed by a species of *Phomopsis*. The underlying wood is dead and of a uniform, light brown colour. Older cankered areas bear numerous minute black fruiting bodies. Infection on young twigs occurs generally early in the winter, near the base of a dormant bud, whence the fungus spreads rapidly down the twigs into the larger branches. Successful inoculations were readily obtained with pure cultures of the fungus.

Another maple was primarily infected by wilt [*Verticillium*: *R.A.M.*, viii, p. 424] and showed further symptoms due to the presence of secondary organisms.

LINDEIJER (EGBERTHA J.). **Een bacterie-ziekte van de Wilg (II).** [A bacterial disease of the Willow (II).]—*Tijdschr. over Plantenziekten*, xxxviii, 1, pp. 9–11, 1 pl., 1932.

A brief account is given of the writer's observations on the transmission of the Dutch bacterial disease of willows [believed to be similar to that attributed in England to *Bacterium salicis*: *R.A.M.*, x, p. 568] by the poplar and willow borer (*Cryptorrhynchus lapathi*) [ibid., xi, p. 274]. The insects feed for a time on the diseased wood and then pass on to healthy branches, in which they bore holes penetrating to the wood.

SCARAMELLA (PIERA). **Sullo svernamento delle Melampsorae dei Salici in alta montagna.** [On the overwintering of the *Melampsorae* on *Salix* in high altitudes.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxviii, 3, pp. 538–540, 1931.

Willows at all altitudes in the Alps are commonly infected by species of *Melampsora* which cause a serious defoliation and a dying back of the young branches in certain species, such as *Salix herbacea* and *S. serpillifolia*, especially when growing in damp localities. The author observed the uredo stage of *M. arctica* on *S. retusa*; *M. reticulata* and *M. alpina* on *S. reticulata*; *M. euonymi caprearum* and *M. ribesii-salicum* on *S. caprea*; *M. ribesii-viminalis* on *S. viminalis*; and *M. ribesii-salicum* on *S. purpurea* and *S. grandifolia*.

During the exceptionally hot, dry summer of 1928 in and near the Alpine botanic garden Chanousia (2,000 to 2,800 m.) it was observed that *S. helvetica*, *S. herbacea*, *S. retusa*, and *S. serpillifolia* growing in the driest places remained apparently healthy, though they had been covered with uredosori in previous years, while those situated near water or in shady places were severely affected. When the apparently healthy willow branches were placed in water in the laboratory, the leaves rapidly became rusted, and the author found that in many branches from such apparently healthy willows a hyaline, intercellular mycelium extended from the epidermis to the pith. It is suggested that these rusts overwinter by means of a perennial mycelium in the branches, which may be prevented from developing further under hot, dry conditions. In confirmation of this view it is stated that apparently healthy willows 48 hours after being copiously watered developed marked infection whereas others in the vicinity remained unaffected. Also, 48 hours after a day's continuous rain every willow examined showed infected leaves, a similar observation being made in the Trentino in 1931 on *S. herbacea* and *S. serpillifolia*. Teleutospores were not observed in any of these cases.

WELCH (D. S.). **Some rusts of Junipers.**—*Seventh Nat. Shade Tree Conf., Proc. Ann. Meeting, August 27, 28, 29, 1931*, pp. 73–78, 1931.

A popular account is given of the symptoms and life-histories of the apple, hawthorn, and quince rusts caused, respectively, by *Gymnosporangium juniperi-virginianae*, *G. globosum*, and *G. germinale* in the United States [*R.A.M.*, x, p. 391]. The apple rust, which affects various wild species of *Pyrus* in addition to the cultivated apple, numbers among its alternative hosts *Juniperus virginiana*, *J. barbadensis*, *J. sabina*, and *J. scopulorum*. The alternative hosts of *G. globosum* are *J. virginiana* and *J. barbadensis*, and those of *G. germinale*, *J. communis*, *J. sibirica*, and *J. virginiana*. The use of fungicides for the control of these diseases is stated to be still in the experimental stage, and the removal of the alternate hosts has given more satisfactory results. A brief discussion of the paper follows (pp. 78–79).

Muskett (A. E.). **The control of diseases and weeds in a forest nursery.**—*Journ. Min. Agric. Northern Ireland*, iii, pp. 102–116, 1 diag., 1931.

This is an expanded account of a paper already noticed from another source [*R.A.M.*, ix, p. 72] describing the control by applications of sulphuric acid of the diseases of Sitka spruce (*Picea sitchensis*) and Douglas fir (*Pseudotsuga taxifolia*) nursery seedlings caused in Northern Ireland by *Corticium solani* and a *Botrytis*.

Gray (W. G.). **An instance of 'damping-off' retarded by the use of basic slag.**—*Forestry*, v, 2, pp. 132–135, 1931.

The author states that in the experimental plots of the Imperial Forestry Institute nursery at Kennington, Oxford, a serious damping-off of seedlings of five coniferous species of trees, caused by an unidentified species of *Fusarium*, was very considerably delayed and reduced in 1930 by the application before sowing of basic slag at the rate of 5·1 tons per acre.

Christensen (C.). **Cultural races of Pestalozzia funerea and the production of variants resembling Monochaetia.**—Abs. in *Phytopath.*, xxii, 1, p. 6, 1932.

Fifteen races of *Pestalozzia funerea* [*R.A.M.*, xi, p. 159], differing from each other in cultural and morphological characters, were obtained by isolating 150 individual conidia from acervuli on longleaf pine (*Pinus palustris*) needles. Ten variants, differing from their parents and from each other in the above characters, arose as sectors in cultures of the races isolated from pine needles. Races agreeing with the description of *Monochaetia* [cf. ibid., viii, p. 66] were obtained from conidia isolated from pine needles and also arose as variants in mono-conidial cultures that normally produced spores bearing 3 to 5 setae. Inoculation experiments on seven species of conifers with spores of the different races gave negative results.

Cartwright (K. St. G.). **The toxicity of preservatives against wood-destroying fungi.**—*Forestry*, v, 2, pp. 138–147, 1931.

After a brief discussion of the advantages and drawbacks of the wood preservatives now in use, the author examines in some detail the various methods of testing these substances for their toxicity to wood-decaying fungi, and suggests that a feasible solution of the whole problem of timber preservation against such rots might be the discovery of a substance which, instead of being directly toxic to the fungi, would prevent their growth by inhibiting or neutralizing their reactions with the host, thus depriving them of food.

Popham (F. J.). **Some experiments on a new idea for wood preservation.**—*Indian Forester*, lvii, 11, pp. 545–546, 1931.

In experiments conducted at the Forestry Research Institute, Dehra Dun, India, it was found that timber preservatives could be divided into two classes, viz., (1) those passing into the cell walls and causing swelling (water-soluble salts, phenols, and alcohols),

and (2) those remaining in the cell spaces, represented by the neutral hydrocarbons, e.g., petroleum and creosote free from tar acids. With creosote containing over 20 per cent. tar acids, a measurable amount of the latter passed into the cell walls, and a system tar acid/cell wall and tar acid/creosote was formed. A similar equilibrium was established when neutral petroleum oils were substituted for creosote. Tar acids, though toxic to fungi and termites, readily leach out of the wood in the rains, so that a high proportion of them in creosote is not desirable.

Petroleum products are frequently stated to render wood waterproof, and three tests were accordingly made on mango (*Mangifera indica*) blocks to determine the preservative value of a mixture of tax acids and cheap paraffin wax residues. The wood was treated (1) with wax residue alone (setting point 55° C.); (2) with tar acids to saturation, followed by hot wax residues; and (3) with a mixture of tar acids and wax residues in equal proportions (setting point 38°). The treated samples were placed in cold water. Tar acids immediately began to leach out of samples (2) and (3), which sank in the water in three days, as also did sample (1). Samples (2) and (3) were placed in fresh water each day for 14 days, at the end of which period tar acids were still leaching out profusely. This method of treatment, therefore, appears to be of little value, and the tests further indicate that the waterproofing qualities of paraffins are inconsiderable.

FALCK (R.). **Ueber die Schutzbehandlung des frisch gefällten Buchennutzholzes.** [On the protective treatment of freshly felled Beech wood for structural purposes.]—*Der Deutsche Forstwirt*, xiv, 4, pp. 21–22, 1932.

Excellent control of the rotting of beech logs due to *Stereum* [? *purpureum*: *R.A.M.*, vii, p. 691] has been obtained by the writer in experiments at Hann.-Münden by the treatment of the freshly felled wood with a new commercial preparation known as xylamon, which is applied by means of a brush or simple spraying apparatus to cut surfaces and wounds. The present cost of xylamon is M. 80 per 100 kg.

FALCK (R.). **Ueber den Einfluss des Flössens auf die Widerstandsfähigkeit des Bauholzes gegen Trockenfäule und über den Holzschutz durch Schimmelbefall und Diffusionstränkung.** [On the influence of floating on the resistance of structural timber to dry rot and on the protection of wood by fungous infection and diffusion saturation.]—*Mitt. Forstwirtsch. und Forstwissensch., 1931*, pp. 480–485, 3 figs., 1931.

The writer states that the well-known fact that structural timber that has become waterlogged by floating in water during its transport is less liable to decay from dry rot [*Merulius lacrymans*], *Coniophora* [*cerebella*], and the like [*R.A.M.*, ix, p. 216], is due in part to heavy infection of such wood by *Trichoderma lignorum* and *T. viridis*, the enzymes of which are poisonous to wood-destroying fungi while they themselves cause little injury. His experiments have shown that such *Trichoderma*-infested wood is resistant to the attack of *C. cerebella*. In order to ensure complete and permanent

protection from the latter, however, the 'floated' wood should be treated before it dries out with injections of water-soluble preservatives, e.g., sodium fluoride, sodium arsenate, or sodium dinitrophenol, which readily diffuse throughout the damp wood. This mode of impregnation has been found greatly superior to the surface treatment of the dry wood.

GIBBS (J. G.). **Experiments with lime on club-root control.**—*New Zealand Journ. of Sci. and Techn.*, xiii, 2, pp. 104–119, 7 figs., 10 graphs, 1931.

Previous attempts at the control of finger-and-toe disease of crucifers (*Plasmodiophora brassicae*) in New Zealand have been unsuccessful, but recent work [cf. *R.A.M.*, x, p. 574] indicates that practical control may be obtained by applications of comparatively small quantities of lime (2 tons air-slaked per acre) three months before sowing (reduction of infection from 80 to 4 per cent.). In another trial the amount of finger-and-toe was reduced from 65 to 5 per cent. by dressings of air-slaked or burnt lime given twelve months before sowing. This treatment must be combined with the application of a strongly basic fertilizer, preferably basic slag, when drilling.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, 1, pp. 10, 15–17, 22–25, 30–37, 1932.

GERMANY (Oldenburg). An Order dated 10th October, 1931, prescribes similar measures for the control of the elm disease caused by *Graphium ulmi* in Oldenburg to those already in force in other parts of the Republic [cf. *R.A.M.*, xi, pp. 208, 272].

ARGENTINE REPUBLIC. By virtue of a Decree dated 9th March, 1931, all consignments of fresh fruit imported into the Argentine Republic must be accompanied by a duly authenticated health certificate. In no case, however, will consignments of fruit infected by any of the following parasites be admitted: *Phyllosticta solitaria* [apple], *Bacterium* [*Pseudomonas*] *citri* and *Pythiacystis* [*Phytophthora*] *citrophthora* [citrus], and *Thielaviopsis* [*Ceratostomella*] *paradoxa* [bananas, pineapple, &c.]. The diseased fruit will be destroyed at the importer's expense and no claims for compensation will be allowed.

BRAZIL. As from 13th November, 1931, all living plants or parts thereof imported into Brazil must be accompanied by an official health certificate stamped by a Brazilian consul. Special declarations are further necessary in certain cases, e.g., potatoes must be accompanied by a certificate vouching for their origin in a locality free from wart disease (*Synchytrium endobioticum*) and powdery scab (*Spongospora subterranea*).

AUSTRIA. The text is cited of an Order of 24th October, 1931, defining the duties of all landholders or occupiers in the protection of their crops and other plants against diseases and pests and giving considerable powers to the authorities to obtain specimens of such plants and to prescribe, under advice, the remedial measures to be taken in the case of outbreaks of serious diseases. Such diseases may be proclaimed after consultation with the agricultural or

forestry associations and the plant protection institute in Vienna, and a subsequent order, of 24th November, 1931, specifies as destructive diseases the black rot of the vine [*Guignardia bidwellii*] and the die-back of elms [*Graphium ulmi*]. Measures against certain other diseases are prescribed in this second Order as well as regulations for the preservation of the health of plants in nurseries and other commercial plantations.

Phony Peach-disease quarantine. Quarantine No. 67. Revision of quarantine and regulations.—*U.S. Dept. of Agric., Plant Quarantine and Control Admin. Leaflet*, 7 pp., 1 map, 1931.

The present revision of the phony peach disease quarantine (No. 67) [*R.A.M.*, ix, p. 416] prohibits the inter-State shipment, without a special Federal permit, of peach trees and roots, nectarine trees and roots, or other kinds of trees or shrubs grafted or budded on peach or nectarine roots, from a regulated area to any outside point or from a regulated area of one quarantined State to any other quarantined State. The regulated areas cover the entire States of Alabama, Georgia, Louisiana, Mississippi, and South Carolina, and parts of Arkansas, Florida, Illinois, North Carolina, Tennessee, and Texas. The conditions governing the issuance of permits for the inter-State movement of the above-mentioned stock are defined.

Bananas in New South Wales.—*Fruit World of Australasia*, xxxii, 9, p. 540, 1931.

Banana heart-rot (infectious chlorosis) [*R.A.M.*, x, p. 472] has been proclaimed a disease under the New South Wales Plants' Diseases Act [1924].

Verboed van invoer van geinfecteerde Cacaoboonen in Amerika. [Prohibition of import of infected Cacao beans into America.] —*De Bergcultures*, v, 47, pp. 1324, 1327–1328, 1931.

The Dutch *chargé d'affaires* in Washington has notified the Governor-General of the Dutch East Indies and the Governor of Surinam of changes in the regulations governing the importation of cacao beans into the United States. Under section 7 of the Federal Food and Drugs Act, as from 1st April, 1932, shipments of cacao beans containing more than 10 per cent. of mould [*R.A.M.*, xi, p. 30] or worm infection, or both, will be detained. It is expected that between this date and 1st October, 1933, when the regulations will be made still more stringent, adequate steps shall be taken to control these defects. On and after the latter date, shipment of cacao beans containing over 10 per cent. mould and worm infection, not more than half of which shall be mouldy, will be considered to be adulterated and detained in consequence.

[An English version of this notification is given.]

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Weber (G. F.). **Bottom rot and related diseases of Cabbage caused by Corticium vagum B. & C.**—*Florida Agric. Exper. Stat. Bull.* 242, 31 pp., 15 figs., 1931.

An expanded account is given of the bottom rot of cabbage caused by *Corticium vagum* [*C. solani*] in Florida, a preliminary note on which has already been published [*R.A.M.*, x, p. 421]. The incidence of the disease may be reduced by soil sterilization in the seed-beds and by careful cultivation, avoiding the banking-up of soil too close to the plants.

Nelson (R.). **Investigations in the mosaic disease of Bean (Phaseolus vulgaris L.).**—*Michigan Agric. Exper. Stat. Tech. Bull.* 118, 71 pp., 11 pl., 1932.

This is a comprehensive account of the results hitherto obtained by the writer and others in studies on bean (*Phaseolus vulgaris*) mosaic [*R.A.M.*, x, p. 283 *et passim*]. Notices of many of the papers cited have already appeared from time to time in this *Review*.

The disease was first recognized by Iwanowski in Russia in 1899 in connexion with his researches on tobacco mosaic (*Centralbl. für Bakt.*, Ab. 2, v, p. 250, 1899), and in the United States by Clinton in 1908 (*Connecticut Agric. Exper. Stat. Rept. of Botanist*, p. 859, 1909). It is now world-wide in distribution and of great economic importance, affecting all the chief commercial varieties of field and canning beans except Robust, as well as *P. vulgaris* var. *humilis*, *P. acutifolius* var. *latifolius*, *P. angularis*, *P. aconitifolius*, *P. calcaratus*, *P. mungo*, *P. lunatus*, *P. limensis*, *P. coccineus*, *Vicia faba*, and *Vigna sesquipedalis*. The symptoms of the disease on the highly susceptible Navy Pea and Refugee varieties are described.

Insect transmission of bean mosaic was accomplished in 1922 under controlled conditions with the potato aphid, *Macrosiphum solanifolii* [*M. gei*], but several years' field observations indicate that the bean leafhopper, *Empoasca fabae*, is more likely to be responsible for the rapid spread of the disease in the open. Seed transmission occurs to a variable extent. In plants grown from infected seeds, the virus is transmitted to about one-half. Generally speaking, infections that take place after flowering do not reach the seed. Evidence is adduced that the escape from infection

of a considerable percentage of the seeds is due to the particular type of vascular anatomy characteristic of the bean pod.

Full details are given of the coccus-like organisms which the author claims to have found in the disintegrating chloroplasts and also in the phloem and wood parenchyma of mosaic but not of healthy beans [ibid., ix, p. 423]. An extremely pleomorphic organism occurs in the leaflets and seeds of beans affected by rugose mosaic, which also contain cocci and *Rickettsia*-like organisms. Isolations from the affected tissues have yielded cultures of all these organisms, but neither the cocci nor the pleomorphic organism was able to reproduce mosaic on inoculation into healthy plants.

A four-page bibliography is appended.

Reid (W. D.). **A bacterial wilt disease of Beans. Occurrence in Marlborough and measures for control.**—*New Zealand Journ. of Agric.*, xliii, 6, pp. 408–415, 4 figs., 1931.

This is a brief account of a bacterial wilt of French beans (*Phaseolus vulgaris*) which is stated to have been recorded for the first time in New Zealand in the Marlborough provincial district in 1931, into which it was presumably introduced with diseased seed from abroad. A survey showed that approximately 25 per cent. of the crops were affected, but the amount of disease varied considerably from one locality to another. The symptoms were similar to those typical of bacterial diseases of the bean in other countries [*R.A.M.*, x, p. 422], and isolations yielded an organism [a technical description of which is given] which in pure culture was found to resemble *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [ibid., xi, pp. 18, 96] except for some differences in size, flagellation, and gelatine liquefaction. The author considers that the differences between his organism and *Bact. medicaginis* as originally described by Sackett are insufficient to place the former in the variety *phaseolicola*, and doubts the validity of this variety, which appears to be merely a form distinguished by its non-pathogenicity to lucerne.

The paper terminates with some considerations on the control of the disease.

Burkholder (W. H.) & Zaleski (K.). **Varietal susceptibility of Beans to an American and a European strain of Phytomonas medicaginis var. phaseolicola, and a comparison of the strains in culture.**—*Phytopath.*, xxii, 1, pp. 85–94, 1932.

The writers discuss and tabulate the results of their experiments on the reaction of 44 American commercial bean [*Phaseolus vulgaris*] varieties to inoculation with two American and one European strain of *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [see preceding abstract]. The varieties reacted similarly to all the strains, some showing a high degree of susceptibility while others maintained considerable resistance To the former group belong Bountiful, Giant Stringless, seven Kidney and Wax varieties, and six others, while the latter includes Black Valentine, French Horticultural. eight Refugee and Wax varieties, Robust Pea, and six more. The remaining 12 varieties used in the tests are probably

of moderate susceptibility. No differences were observed in comparative cultures of the American and European strains of the pathogen.

SEVERIN (H. H. P.). **Modes of curly-top transmission by the Beet leafhopper, Eutettix tenellus (Baker).**—*Hilgardia*, vi, 8, pp. 253–276, 6 figs., 1931.

Continuing his studies of the transmission of curly top of the beet by the leafhopper *Eutettix tenella* [*R.A.M.*, viii, p. 84], the author gives details of experiments which showed that previously non-infective insects can transmit the disease to healthy plants within 20 minutes of feeding on diseased beets, the percentage of successful transmissions increasing with the length of time the carriers were allowed to feed on the healthy plants, and also with the number of insects used in the tests. The shortest period necessary for a single insect to transmit curly top was seven hours, and only two or three per cent. of the single insect transmissions succeeded when the incubation period in the insect was less than 24 hours. The percentage of transmissions by single insects with virus incubation periods of one to seven days varied from 13·3 to 40, the lowest percentage occurring at the end of one day.

Further tests showed that when previously non-infective *E. tenella* nymphs were fed on an extract prepared from the mouth parts excised from infected individuals, they transmitted the disease to two beet seedlings, but the incubation period was prolonged to 24 and 34 days, respectively. Non-infective nymphs fed on culture media containing the excreta or a filtrate from the faeces of infective insects failed to transmit curly top to healthy beets.

LEACH (L. D.). **Downy mildew of the Beet, caused by Peronospora schachtii Fuckel.**—*Hilgardia*, vi, 7, pp. 203–251, 10 figs., 1 diag., 2 graphs, 1931.

This is a detailed account of the author's investigation of the downy mildew (*Peronospora schachtii*) of the beet [*R.A.M.*, viii, p. 695] in California, in the central region of which it is stated to have attained considerable severity in 1929, causing particularly heavy losses (conservatively estimated at $100 per acre) in fields of garden beets grown for seed. The disease was also serious on market beets in the coastal districts south of San Francisco.

Field observations and experimental work showed that the fungus attacks the beets at all stages of development. In seed-beet fields infection of the inner rosette leaves is usually the most conspicuous symptom, but during wet periods secondary infection occurs as isolated areas on the outer leaves. Flower shoots are frequently invaded systemically, the entire inflorescence then assuming a stunted and compact habit. Infected bracts and flower parts are swollen, distorted, and discoloured. Mycelium and oospores of the fungus were found abundantly in the pericarp and sepals of beet flowers, and occasionally in the funiculus and integuments of the ovule. Mycelium and haustoria resembling those of *P. schachtii* were also found inside the testa of viable seed from seed balls bearing dry conidiophores on their surface.

Experiments under controlled conditions indicated that the conidia of *P. schachtii* can germinate within a range of temperatures from below 0·5° to near 30° C., with an optimum between 4° and 7°. The greatest development of the germ-tube in the first 24 hours occurred at 12°. A few of the conidia were still viable after 40 days at −12° C. A high percentage of infection was obtained on seedlings sprayed with conidial suspensions at temperatures between 0·5° and 20°, but at 30° infection was slight. The cotyledons and newly formed leaves were the most susceptible portions of the seedlings.

Inoculation experiments gave positive results on ten varieties of garden beets, nine of mangels, and three of sugar beets, and also on *Beta vulgaris* var. *cicla* (Swiss chard), *B. bourgaei*, *B. macrocarpa*, *B. maritima*, *B. patellaris*, *B. patula*, *B. procumbens*, *B. scutellaris*, and *B. vulgaris* var. *abyssinica*. No infection was obtained on *Chenopodium album*, *C. murale*, and spinach, while *P. effusa* from spinach failed to infect beet and Swiss chard.

The investigation also confirmed that beet downy mildew is transmitted with the seed, and that the organism may hibernate by means of perennial mycelium in the crown of the beets. While no adequate control measures are yet known, a measure of protection may be attained by the use of disease-free seed, avoidance of infected soils, and the elimination of infected seedlings.

HENDERSON (W. J.). **Studies of the properties and host reaction of the Onion to the yellow-dwarf virus.**—Abs. in *Phytopath.*, xxii, 1, p. 11, 1932.

In sterile distilled water at 23° C., the virus of yellow dwarf of onions [*R.A.M.*, x, p. 499] is inactivated after 112 hours, and in onion leaves at the same temperature, after 100 hours. The thermal death point of the virus, when heated for 10 minutes, lies between 75° and 80° C. The infective capacity of the virus was not impaired by 10 minutes' freezing at −10°. Eighty per cent. of healthy bulbs inoculated in the growing tips with two hypodermic injections of 0·75 c.c. each became infected. Three injections, of 0·42 c.c. each, infected 72 per cent., and one of 2 c.c. was pathogenic to 25 per cent. of the plants. Healthy onions, inoculated in the leaves at a height of 1½ inches, showed symptoms on 35 to 40 per cent. of the plants during the current growth, while 50 to 60 per cent. showed masked symptoms in the next growth period. When inoculated at a height of 4 to 6 inches, the plants showed 5 to 20 per cent. infection during the current growth and 25 to 40 per cent. in the second growth periods. The inoculation of plants 7 to 8 inches in height failed to cause yellow dwarf symptoms in the first growth period but led to the development of 25 to 30 per cent. during the second.

DORAN (W. L.) & BOURNE (A. I.). **Onion spraying and dusting experiments.**—*Massachusetts Agric. Exper. Stat. Bull.* 279, pp. 176–185, 1931.

The results [which are discussed and tabulated] of three years' experiments in Massachusetts in the control of downy mildew (*Peronospora schleideni*) and blast of onions [*R.A.M.*, ix, p. 629]

showed that copper-lime dust injured the plants in two out of three seasons and failed to control blast. Bordeaux mixture 4:4:50 and 8:4:50 did not harm the plants when applied with a suitable power sprayer at a pressure of 100 to 150 lb., and resulted in a somewhat increased yield even in the absence of both diseases. The onset of blast was delayed, but not prevented, by Bordeaux mixture, and the increased yields due to the treatment were not sufficient to justify the annual spraying of onions since the diseases in question are not of constant occurrence.

DAVIS (G. N.) & REDDY (C. S.). **A seedling-blight stage of Onion bulb rot.**—Abs. in *Phytopath.*, xxii, 1, p. 8, 1932.

Heavy losses have been caused in the Clear Lake [California] district by a seedling blight and bulb rot of onions caused by a *Fusarium* resembling *F. zonatum* form 1 [*R.A.M.*, viii, p. 280]. In seedlings the tips whiten, and then die back following infection of the roots which at first show a dull, leaden discoloration and then decay. Bulb rot occurs both in the field and in storage. In some plots only half the original stand remained at harvest and this was largely diseased, while in one large field 90 per cent. of the plants were lost and the crop was a failure.

WEBER (G. F.). **Spraying and dusting Cucumbers for control of downy mildew from 1925 to 1930.**—*Florida Agric. Exper. Stat. Bull.* 230, 58 pp., 1 fig., 1931.

A review is given of the literature on the control of downy mildew of cucumbers (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*), together with a report of experimental results obtained during the period 1925–30 in Florida [*R.A.M.*, x, p. 646]. While copper stearate dust was the most effective fungicide, it was considerably more expensive than the almost equally beneficial 2–4–50 Bordeaux mixture, the cost per hamper of the increased yield being 42 cents for the former preparation compared with only 16½ cents for the latter. The corresponding figure for copper-lime dust, which also gave very good control, was 50 cents per hamper. In comparison with the untreated plots those sprayed with Bordeaux mixture and copper-lime dust produced 14 and 13 per cent. more fruit, respectively. Five applications of the fungicides were necessary to ensure adequate control. Hydrated lime was found to be a good substitute for rock lime in the preparation of Bordeaux mixture. Sulphur in various forms injured the plants.

GREEN (D. E.). **Note on the disease resistance shown by Butcher's Disease Resister Cucumber to Cercospora leaf spot.**—*Journ. Roy. Hort. Soc.*, lvii, 1, pp. 63–64, 1 pl., 1932.

In recent outbreaks in England of the leaf spot of cucumbers due to *Cercospora melonis* the Butcher's Disease Resister variety has again maintained its resistance [*R.A.M.*, ix, p. 358]. All attempts to arrest the spread of infection on the susceptible Jasper Queen by fumigation with sulphur, soil sterilization and disinfection of the houses with formalin, and spraying the plants with liver of sulphur gave negative results. The use of the Disease Resister variety

appears to be the sole means of eradicating this extremely troublesome fungus from the greenhouses.

Layton (D. V.). **Host response of Citrullus vulgaris to Colletotrichum lagenarium.**—Abs. in *Phytopath.*, xxii, 1, p. 16, 1932.

The maximum amount of infection was produced on watermelons by *Colletotrichum lagenarium* in the greenhouse at 20° to 28° C., with a relative humidity of 93 per cent. [*R.A.M.*, viii, p. 294; x, p. 771]. Less infection occurred at 17° and none at 15° with 90 per cent. humidity. A high degree of resistance to the fungus was shown by the citrons (especially Majorta, an African forage melon), but most of the oriental varieties were decidedly susceptible. The F_2 and F_3 generations of citron-watermelon hybrids were considerably less susceptible than commercial watermelons, while marked resistance has further been shown by several inbred segregates from chance edible hybrids of Conqueror, viz., selections from Iowa Belle (Q 21), Iowa King (Q 23), and Q 20, which are also resistant to wilt [*Fusarium niveum*: ibid., x, p. 431].

Sleeth (B.). **Physiologic strains of Fusarium niveum.**—Abs. in *Phytopath.*, xxii, 1, p. 24, 1932.

The failure of the Conqueror watermelon to maintain its resistance to wilt (*Fusarium niveum*) [see preceding abstract] in certain melon-growing sections suggested the possible existence of strains of the fungus with varying degrees of pathogenicity. Cultures of the organism were obtained from Texas, North and South Carolina, Iowa, and West Virginia, and greenhouse experiments were conducted during 1930–1 to determine the relative degree of pathogenicity of the various strains to different watermelon varieties. Tested on six varieties, strain 3 produced an average of 90 to 95 per cent. wilting; strains 8 and 6, 85 to 90 per cent.; strains 4 and 1, 80 to 85 per cent.; strain 2, 70 to 75 per cent.; strain 7, 65 to 70 per cent.; strain 5, 45 to 50 per cent.; and strain 9, 20 to 25 per cent. Twenty-three strains of *F. niveum* have been isolated, which exhibit cultural characters indicating the possible occurrence of as many physiologic forms.

Dufrénoy (J.). **Sur les facteurs écologiques du développement du Plasmopara viticola.** [On the ecological factors of the development of *Plasmopara viticola*.]—*Comptes rendus Soc. de Biol.*, cviii, 36, pp. 967–970, 2 graphs, 1931.

After very briefly describing the life-cycle of *Plasmopara viticola* on vine leaves the author states that during 1931 in the vicinity of Bordeaux, rains lasting from 1st to 8th and from 17th to 20th May led to two successive primary infections, conidiophores appearing on affected leaves on 28th May and 9th June, respectively. In an experimental vineyard 48 lots each of 10 Cabernet Sauvignon vines were sprayed once each at intervals of two days, the first lot being sprayed on 4th May and the last on 19th August. On the vines treated before 18th May, on which fewer than seven leaves had as yet appeared, all the leaves developing subsequently to the seventh were exposed to infection arising from the primary

infection of 17th–18th May, though sunny weather in June and July inhibited the spread of the fungus: these vines retained none of their leaves. Rain set in again from 1st August and lasted until September. Those vines which were sprayed once between 20th May and 1st August inclusive kept their leaves and formed fruit clusters, whereas those sprayed once from 3rd August onwards became totally defoliated. Adequate protection throughout the season was secured on the other vines in the vineyard by nine sprayings.

[PETHYBRIDGE (G. H.)]. **England and Wales: new and interesting phytopathological records for the year 1931.**—*Internat. Bull. of Plant Protect.*, vi, 2, pp. 21–22, 1932.

The following fungi observed during 1931 are believed to be new records for England and Wales. *Kunkelia nitens* was found on dewberry (*Rubus* sp.) recently introduced from the United States [*R.A.M.*, v, p. 167]. *Chalaropsis thielavioides* was detected on the surface of stored carrots; the pathogenicity of the fungus, which was also found associated with walnut graft failures, is regarded as doubtful. A leaf and fruit spot of strawberries in the west of England was apparently due to *Stagonospora fragariae* [ibid., x, p. 553]. *Agrostis* sp. in an upland meadow in Derbyshire was extensively destroyed by *Sclerotium rhizodes* [ibid., x, p. 776]. The aecidial stage of *Uromyces trifolii* [ibid., viii, p. 176] was detected for the first time on clover, on which the uredo and teleuto stages are not uncommon.

The following are thought to be new British records for the particular hosts involved: *Mycosphaerella pinodes* [ibid., xi, p. 17] on sweet pea; *Gloeosporium album* on quince fruit; and *Sclerotium tuliparum* [see below, p. 460] on corms of *Colchicum* sp.

SALMON (E. S.) & WARE (W. M.). **Mycological Department.**—*Journ. South-Eastern Agric. Coll., Wye, Kent,* xxix, pp. 15–22, 1932.

In the late summer of 1931, *Bacterium tumefaciens*, present for several years on cultivated blackberries at Wye [cf. *R.A.M.*, x, p. 116], was conspicuous on the late variety Himalayan Giant not only at ground level but also on the fruiting canes of the current year. The galls were numerous on canes trained 3 or 4 ft. from the ground, and usually they were present at the base of the fruiting laterals. There was some indication that galls appeared also where the canes had been bent or rubbed. Loganberries [*Rubus loganobaccus*] in a plantation which had cropped heavily in 1930 were also attacked [ibid., viii, p. 627], about 100 plants out of 4,000 being killed by May, 1931.

Phellinus cryptarum Karst. was present on the decaying roof timbers of a church at Maidstone, and cricket-bat willows [*Salix caerulea*: ibid., iv, p. 322; vi, p. 520] near Wye showed large branch cankers caused by *Discella carbonacea*.

Onions from near Salisbury were attacked by a fungus closely agreeing with *Heterosporium allii* var. *cepivorum* [ibid., vii, p. 218], which caused light brown spots on the leaves.

Proof was obtained that chlorotic disease of hops [ibid., ix, p. 742]

is transmissible by sap, unlike hop mosaic; experiments demonstrated that the characters of mosaic and the chlorotic disease may be produced in one and the same plant, and that mosaic carriers may be induced to show definite symptoms of mosaic some time after inoculation with the virus from chlorotic hops.

BAUDYŠ (E.). **Fytopathologické poznámky VII.** [Phytopathological notes VII.]—*Ochrana Rostlin*, xi, 6, pp. 178–197, 9 figs., 1931. [German summary.]

In this new series of phytopathological notes [cf. *R.A.M.*, x, p. 295] the author states that a severe form of mosaic, characterized by exaggerated erectness of the foliage, dwarfing, various deformations and spotting of the leaves, and sterility and premature death of the affected plants, was observed in certain varieties of soybeans, a new crop which is being tried in Czecho-Slovakia. The disease is apparently seed-borne, since other varieties growing intermixed with, or in the immediate neighbourhood of the diseased varieties, remained free from the disease, no spread being noticed in the field. In general, mosaic diseases were very prevalent on many crops in 1931 [ibid., xi, p. 258], particularly so on plums, apricots, and peaches, the cultivation of which may even be endangered if no remedial measures are found to check the rapid dissemination of the trouble. On garden and sugar beets a form of mosaic was seen in which the main nerve split at the apex of the leaves, causing a more or less extensive division of the leaf in two.

Lettuce in some localities of Moravia was attacked by two bacterial rots, the first of which affected the heart of the plant, while the second started from the outer leaves and progressed inwards; isolations yielded a species of *Pseudomonas* in the first and a species of *Micrococcus* in the second case. These diseases should be amenable to control by thorough disinfection and ventilation of the hotbeds in which the lettuce seedlings are grown.

The year under review was marked by a considerable development of various species of *Taphrina* on stone fruit trees, particularly numerous witches' brooms having been observed on *Prunus avium* caused by *T. cerasi* [ibid., viii, p. 655] and on plums by *T. insititiae* [ibid., vi, p. 762].

MCRAE (W.). **Report of the Imperial Mycologist.**—*Scient. Repts. Imper. Inst. Agric. Res., Pusa, 1930–31*, pp. 73–86, 1932.

Further studies at the Pusa Agricultural Research Institute, India, on wilt (*Fusarium vasinfectum*) resistance in 'rahar' (*Cajanus indicus*) [*R.A.M.*, x, p. 436 and next abstract] confirmed the superiority of the A.2 (W.R.) type over T.1, the percentages of infection in test rows of which were 1 and 74, respectively. Type A.4 also showed a high degree of resistance to wilt (average of 1·8 per cent. infection in six test plots compared with 63 per cent. in T.1). On a 27-acre field in the regular three-year six-course rotation with pigeon pea once in three years, 20 per cent. of the plants were wilted, and in one patch the percentage reached 55. In a field where no regular rotation is followed and pigeon pea has not been grown for eight years, there were no wilted plants in 11 acres of

six farm selections and 9 acres of A.4. Thus, the known interval of survival of the fungus in the soil has been reduced from ten to eight years. Of the 41,262 plants inspected in the cultivators' fields round Pusa, 2,566 (6·2 per cent.) were found to be wilted. Further experiments to determine the effect of superphosphate on the development of pigeon pea roots confirmed previous observations showing that both the plants and the wilt fungus grow more vigorously under this treatment.

The seed of pigeon pea plants suffering from partial sterility [see next abstract] has been found to produce healthy progeny in two successive seasons, and the injection of leaf juice from diseased into healthy young plants gave negative results.

A *Colletotrichum* attacking pigeon pea at Pusa has been found to agree with *C. cajani* Rangel [ibid., vi, p. 593], and in culture produces an ascigerous stage corresponding in general characters with *Glomerella cingulata*. The leaves and petioles of pigeon pea are further liable to infection by the conidia of a new species of *Cercospora*, two strains of which were observed, one from Allahabad and the other from Pusa. The fungus grows at a temperature range of 6° to 37° C., with an optimum between 27° and 28° in alternate light and darkness. Development occurs from 47 per cent. humidity upwards, but is most profuse at 100 per cent. On a modified Richards's solution the fungus grows between P_H 2 and 9·7, with an optimum at 6·7, all concentrations being reduced to about 2·9 after 45 days.

Mosaic of sugar-cane [ibid., xi, p. 223] was detected on the Co. 302 and 205 varieties, the other 29 Coimbatore varieties, as well as T.U.C. 393 and 472 and P.O.J. 2871, 2878, and 2696 remaining free from the disease. Infection is stated to have been reduced to a minimum by five years' roguing.

Isolated cases of top rot of sugar-cane were observed and a species of *Fusarium* resembling *F. moniliforme* [*Gibberella moniliformis*] was isolated and shown by inoculation experiments to be parasitic [ibid., ix, p. 431]. *Sclerospora sacchari* has not been found on sugar-cane in the field since the previous year [ibid., x, p. 690]. Inoculation experiments with this fungus on maize and *Euchlaena luxurians* gave positive results. Four plants raised from setts of last year's infected cane (found in May) showed the disease in June, 1931.

Inoculation experiments on gram (*Cicer arietinum*) seedlings with a species of *Fusarium* isolated from wilted plants gave positive results, the number of successful infections being higher at 24° to 27° than at 18° to 20°. *Rhizoctonia* [*Corticium*] *solani* and a new species of *Sclerotium* were found together in the collar and roots of gram plants, causing shrinking, cracking, and ultimate death. Both organisms proved to be parasitic. The incidence of *Mystrosporium* leaf blight on gram [ibid., ix, p. 431] was relatively slight, only the T. 68 variety being appreciably damaged. Seed disinfection in 0·5 per cent. formalin was found to kill the spores without impairing germination.

The wheat bunt due to *Tilletia indica* [ibid., x, p. 780] has been found on a number of Punjab × Federation hybrids. The presence of the fungus can only be detected by the examination of the grain

after threshing, and so far little damage appears to be caused. Wheat from different parts of the Punjab was examined by Dr. Mitra in the Lahore market and found to be fairly extensively infected. No bunt developed at Pusa in plants grown from the affected Punjab varieties, and inoculation experiments in the former locality also gave negative results. Freshly collected *T. indica* spores were found to be incapable of germination, which occurred, though poorly, in those eight or nine months old.

Helminthosporium tritici-repentis was far more common on wheat in the Pusa district than *H. sativum* [ibid., x, p. 437]. The varieties most susceptible to both species are P.4 and P.111, while P.12, P.52, P.101, P.163, and country wheats are relatively resistant. *H. teres* caused severe damage on the T.6, T.7, and T.21 barley varieties [ibid., x, p. 233]. Both *H. nodulosum* and *H. leucostylum* cause leaf spot, seedling blight, and head blight of *Eleusine coracana* and *E. aegyptiaca* [ibid., x, p. 437], the former also being responsible for foot and root rot. The temperature range for infection by *H. nodulosum* was found to extend from 10° to 37°, with an optimum at 30° to 32°, and inoculation experiments with it on wheat, oats, barley, maize, sorghum, sugar-cane, *Pennisetum typhoideum*, *Panicum frumentaceum*, and *P. miliaceum* gave positive results.

The *Phytophthora* isolated from *Cinchona* [ibid., ix, p. 431] forms no oospores in pure culture but does so in mixed cultures with *P. colocasiae*, *P. parasitica*, *P. faberi*, or *P. palmivora* [cf. ibid., xi, p. 205]. On the basis of extensive cultural studies the *Phytophthora* isolated from *Piper betle* in Bengal and Madras [ibid., xi, pp. 158, 283] has been found to be *P. parasitica*. The disease may be controlled by the application of Bordeaux mixture $2\frac{1}{2}:2\frac{1}{2}:50$ in areas not exposed to frequent flooding. *C. solani* is spreading on *P. betle* in some areas, where attempts at control with a soil disinfectant are in progress.

The mycelium of a species of *Fusarium* was found in the vascular bundles of the roots, shoots, and petioles of chilli (*Capsicum annum*) plants suffering from a serious wilt that destroyed the crop before the ripening of the fruits.

The mycelium and sclerotia of *R. bataticola* [*Macrophomina phaseoli*] were found in the rotting tissues of violet plants showing a pale yellow discoloration and curling of the leaf margins and a softening of the root-stock, the cortex of which peeled off readily while the central stele was black and soft.

A species of *Phytophthora* was isolated from *Hibiscus sabdariffa* from Dacca, and an apparently undescribed species of *Alternaria* from tobacco from Rangpur.

ALAM (M.). **Appendix 1 (b). Administration Report of the Botanical Section for the year ending the 31st March 1931.** —*Rept. Agric. Dept. Bihar and Orissa for the period from the 1st April 1930 to 31st March 1931*, pp. 42–65, 1931.

The following information of phytopathological interest is included in this report. The Sabour 2 E 'rahar' [*Cajanus indicus*] selection has given great satisfaction both from a general standpoint and also on account of its resistance to wilt [*Fusarium vasin-*

fectum: see preceding abstract], and other pathological conditions, including 'sterility', the cause of which is stated on p. 130 to be still unknown. The incidence and severity of this last disease have been found to vary considerably from year to year and are believed to depend on external factors. Some of the best Sabour types of pigeon pea have been found resistant to sterility and may safely be cultivated on a large scale. A strain from Pusa, almost as prolific as the high yielding Sabour 7S and Pusa P, proved resistant to wilt even on artificial inoculation.

The Sabour 6 selection of linseed has shown a high degree of resistance to wilt [*F. lini*: *R.A.M.*, vii, p. 303], and promising results have been given by hybridization experiments with this strain and the best yielding Pusa types, T. 12 and T. 121.

VAN DER BYL (P. A.). **Agriculture in the winter rainfall area. The work of an important institution.**—[*Ex* Annual Report of the Secretary for Agriculture. Year ended 30th June, 1931.] —*Farming in South Africa*, vi, 68, pp. 354–358, 1931.

In connexion with an account of the work of the Stellenbosch-Elsenburg College of Agriculture, mention is made of the detection, for the first time in South Africa, of virus infections on wild mustard or 'ramenas' (*Raphanus raphanistrum*), *Calendula officinalis*, *Tithonia diversifolia*, and granadilla (*Passiflora* sp.). The virus from *R. raphanistrum* has been found to be capable of infecting turnips.

STOREY (H. H.). **Report of the Plant Pathologist.**—*Third Ann. Rept. East African Agric. Res. Stat., Amani, 1930–1,* pp. 13–15, 1932.

During the period under review the writer was engaged mainly on the study of virus diseases, especially maize streak [*R.A.M.*, xi, p. 66], while investigations are also in progress, in collaboration with R. Leach, on the problem of 'yellows' of tea in Nyasaland [ibid., x, p. 706]. Brief notes are given on these and other lines of research.

Fiftieth Annual Report of the Ohio Agricultural Experiment Station for the year ended June 30, 1931.—*Ohio Agric. Exper. Stat. Bull.* 497, 201 pp., 23 figs., 4 diags., 14 graphs, 1 map, 1932.

The section of this report on botany and plant pathology (pp. 54–69) contains the following items in addition to those already noticed from other sources. The results of the past three seasons' tests in apple scab [*Venturia inaequalis*] control by H. C. Young indicate that either flotation or mist brand sulphur [cf. *R.A.M.*, ix, p. 796; x, p. 645] is effective during the post-bloom period under fairly severe conditions. A new product, hydrophilic colloidal sulphur [ibid., xi, p. 152], and two dusts, viz., sulphur with finely ground lime-sulphur and manganar-sulphur, also gave excellent control of this disease. H. C. Young and F. Winter found that Brooks's fruit spot of apple [*Mycosphaerella pomi*: ibid., ix, p. 508; x, p. 391, *et passim*] is also amenable to control by hydrophilic colloidal sulphur, as well as by two applications of 1–3–50 Bordeaux

mixture; the latter, however, is apt to cause severe russeting of the fruit.

Good control of gladiolus scab (*Bacterium marginatum*) was given in P. E. Tilford's tests by five minutes' immersion of the corms (mixed and Foch variety) in calomel or calogreen (an extra fine grade of calomel), used at a strength of 1 lb. to 2½ galls. water [ibid., x, p. 438].

In experiments conducted by P. E. Tilford to determine the effect of increasing the lime content of Bordeaux mixture (to induce cooling of the leaves) on the yield of sprayed potatoes [ibid., ix, p. 258], it was found that the plants treated at the rate of 4–12–50 produced 432·3 bushels per acre compared with 406·4 and 352·3 for the plots receiving 4–9–50 and 4–6–50 Bordeaux mixture, respectively [ibid., ix, p. 258].

J. D. Wilson found that copper-lime mixtures gave better control of bacterial wilt of cucumbers [*Bacillus tracheiphilus*: ibid., x, p. 500] than lime-lead arsenate or gypsum-calcium arsenate dusts, but since the latter caused less stunting the final yields were higher in the plots on which they were used.

The best control of tomato leaf mould (*Cladosporium fulvum*) in greenhouse trials by L. J. Alexander was given by five or six weekly applications of hydrophilic colloidal sulphur (4 lb. to 100 galls. water), beginning about 10th September.

The following procedure was found by H. F. Winter to be effective against crown gall [*Bacterium tumefaciens*] of black raspberries [*Rubus occidentalis*: ibid., x, p. 116]. Healthy stock should be planted on land that has not grown brambles, vines, fruit, or nursery stock for the past five years. The plantings should be inspected when the old canes are removed, diseased plants rogued out, and the soil disinfected with formaldehyde (1 pint to 6 galls. water) applied at the rate of ½ gall. per sq. ft. of soil surface. The causal organism may be carried on pruning tools, farm implements which should be disinfected in 1 in 1,000 corrosive sublimate, by human and animal agency, and by drainage water. Inspections were made of approximately 90 acres of black raspberries belonging to 32 growers that had been inspected and rogued since 1925 and kept isolated in various places in Ohio in connexion with the virus disease control project [ibid., xi, p. 381]. The total number of virus-diseased plants was found to be 0·68 per cent. in the Cumberlands and 0·17 per cent. in the Plum Farmers.

In the course of studies by R. C. Thomas on the structure of the hyphae of *Pythium ultimum* the action of basic dyes (thionin and resorcin blue) gave strong evidence of the presence of an acidic carbohydrate similar to that found in *Sclerotinia* and designated as callose, while treatment with alcoholic potash showed that a certain amount of cellulose was also present.

In a preliminary test by R. C. Thomas on the action of organic mercury compounds on plant and human pathogens, the former group comprising *Phytomonas* [*Bact.*] *pruni*, *P.* [*Bact.*] *tumefaciens*, *Erwinia amylovora* [*B. amylovorus*], and a bacterium causing wilt of sweet clover (*Melilotus alba*), a calculation of the phenol coefficients of the dilutions of metaphen and merthiolate

killing these organisms at $2\frac{1}{2}$- and 15-minute intervals indicated the superiority of the former in every case.

Agricultural Research in New Hampshire.—Annual Report of the Director of the New Hampshire Agricultural Experiment Station for the year 1930.—*New Hampshire Agric. Exper. Stat. Bull.* 256, 27 pp., 8 figs., 1931. [Received May, 1932.]

The following items of phytopathological interest occur in this report (p. 16). O. Butler found that temperature is largely responsible for the difference in behaviour of potato diseases in northern and southern New Hampshire. Healthy plants and those affected by mosaic and leaf roll were grown in the greenhouse (*a*) at a mean temperature closely approximating to that of the certified seed-producing (northern) area of the State, and (*b*) at a mean temperature close to that of southern New Hampshire. According to expectation, the mosaic plants grown at the higher temperature showed only mild or obscure symptoms, while those at the lower temperature were conspicuously affected. The typical leaf roll symptoms were also more apparent at the low than at the high temperature [cf. *R.A.M.*, viii, p. 552]. The average number of tubers per plant was not affected by temperature, but the yield of the diseased plants was better at the higher temperature, the reverse being the case with healthy ones.

The same worker found that scorching of foliage follows the use of a 1 per cent. Burgundy mixture in which the proportion of copper sulphate to sodium carbonate is increased to 1:0·5. Mixtures of 1:1 and 1:1·5 produced no injury on beans [*Phaseolus vulgaris*], while very slight damage was caused by one of 1:1·84. With apples the appearance of injury was delayed by increasing the amount of sodium carbonate, though eventually the total amount of damage was much the same for all the mixtures tested except the most harmful, 1:0·5. Further experiments on the prevention of deterioration in Burgundy mixture showed that the addition of citric or tartaric acid (preferably the former) to an acid mixture, becoming neutral on standing, will ensure keeping for an indefinite period.

HEALD (F. D.). **Division of Plant Pathology.**—*Forty-first Ann. Rept. Washington Agric. Exper. Stat. for the fiscal year ended June 30, 1931* (*Bull.* 260), pp. 47–50, 1931.

Some of the items in this report have already been noticed from other sources. The following are amongst the diseases reported for the first time from the State of Washington: fruit rot of pears (*Phytophthora cactorum*) [*R.A.M.*, xi, p. 111]; leaf blight or cast of Douglas fir [*Pseudotsuga taxifolia*] in the Blue Mountains, caused by *Rhabdocline pseudotsugae* [ibid., ix, p. 617]; a very severe damping-off and blight of sweet clover [*Melilotus alba*] at the Experiment Station due to an undetermined species of *Pythium*; early rot or blast of cranberries (*Guignardia vaccinii*) [ibid., xi, p. 188] in Grays Harbor; artichoke [*Cynara scolymus*] wilt (*Sclerotinia sclerotiorum*); and leaf spot of lily (*Botrytis elliptica*) [ibid., xi, p. 243].

Mosaic of iris [ibid., x, p. 162] has been reported as prevalent and severe in several coastal areas, while a disease of rhubarb, possibly due to the beet curly top virus, has been observed both east and west of the Cascades. *Fusarium* wilt of peas [*F. orthoceras* var. *pisi*: ibid., xi, p. 86] is apparently becoming more prevalent in the seed-producing area of eastern Washington, where a study of varietal resistance and other phases of the disease has been initiated.

Botany.—*Forty-fourth Ann. Rept. Georgia Exper. Stat. for the year 1931*, pp. 33–36, 1 col. pl. (opposite p. 28), 1931.

Owing to extremely dry weather during the autumn, the pimento pepper [*Capsicum annuum*] crop sustained little injury from ripe rot (*Vermicularia capsici*) [*R.A.M.*, x, p. 57], which has been found to overwinter on decayed fruits left in the field. This débris and infected seed appear to be the principal sources of spring infection.

Further studies on cotton root disease (*Fusarium moniliforme*) [*Gibberella moniliformis*: ibid., ix, p. 436] showed that certain dusts are very effective in the control of the causal organism and in augmenting the yield of the crop, besides being cheaper and more convenient than the delint-soak method of seed disinfection. The following preparations were tested, all at the rate of 4 oz. per bushel: ceresan, Du Bay 971 A, Du Bay 965 D, Du Bay 971 C, Ansbacher-Siegle No. 14, and 20 per cent. mercuric chloride dust, one plot being left untreated and another planted with delinted seed soaked in mercuric chloride solution (1 in 1,000) for 20 minutes. The best results were given by ceresan and Du Bay 965 D, the yields of the early and late sowings in the plot treated with the former being 1,236 and 1,536 lb. per acre, respectively, and for the latter 1,260 and 1,428 lb., compared with 1,092 and 1,344 lb. for the control and 1,212 and 1,440 lb. for the plot treated by the delint-soak method. The other dusts also gave increased yields in comparison with the controls.

The Spanish peanut, the common variety in Georgia, has been found highly susceptible to leaf spot (*Cercospora personata*), to which the runner types (Virginia and Carolina Runner) are quite resistant.

Temperatures between 15° and 27° C. appear to favour the development of peach rosette in inoculated trees [ibid., xi, p. 356].

Very good results in the control of downy mildew of cantaloupes [*Pseudoperonospora cubensis*: ibid., x, p. 500] were given by a Bordeaux mixture with a high lime content (3–9–50), which augmented the yield without causing spray injury.

Palm (B.). **Pflanzenkrankheiten aus Guatemala.** [Plant diseases from Guatemala.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xlii, 1, pp. 11–17, 1932.

An annotated list is given of the plant diseases (excluding those due to viruses, which will be described elsewhere) observed by the writer during his four years' residence in Guatemala. Groundnuts are attacked by *Septogloeum arachidis* [*Cercospora personata*:

R.A.M., ii, p. 351; xi, p. 20] and *Sclerotium rolfsii*, the former causing a reduction of yield when the crop is interplanted with rice and maize.

Chilli (*Capsicum annuum*) is liable to extensive infection by mildew (*Oidium* sp.) and appears to be almost constantly affected by mosaic [ibid., x, p. 809].

Coffee is widely attacked by *Cercospora coffeae* Zimm., which seldom, however, causes appreciable damage. *Corticium koleroga* is much in evidence, its development and spread apparently being promoted by too dense planting and the overhung shape of the trees. The most serious disease of coffee in Guatemala, however, is that caused by *Omphalia flavida* [ibid., viii, p. 378], the *Stilbella* stage of which is found on a number of common plantation weeds, e.g., *Borrera* sp., *Commelina* sp., and *Cleome* sp., as well as on the shade trees, *Inga* sp. and *Musa* sp. The control of *O. flavida* should be based, in the first instance, on a rational system of weed eradication.

The most important disease of cotton in Guatemala is that caused by *Bacterium malvacearum*.

Cacao suffers heavy damage from *Phytophthora faberi* [*P. palmivora*], which is thought to be partially responsible for the extremely low yield of beans per acre (300 lb. or less).

Tobacco is infected by *Botrytis cinerea*, *Cercospora nicotianae*, *Oidium tabaci* [*Erysiphe cichoracearum*], and *P. nicotianae*, the last-named causing very heavy damage on the plateau.

Tomatoes growing under unfavourable conditions may be severely attacked by *Septoria lycopersici* and *P. infestans*.

Gloeosporium mangiferae is prevalent on mango trees in the coastal regions, especially during the rainy season [ibid., vii, p. 305], when almost all the inflorescences may be attacked, the foliage being less affected.

Uromyces appendiculatus [ibid., x, p. 775] causes severe and extensive damage to beans [*Phaseolus vulgaris*], one of the staple native food crops. The same host is also liable to infection by *C. canescens* [ibid., vii, p. 538; viii, p. 66] and *Isariopsis griseola* [ibid., x, pp. 83, 775], the former being particularly severe at high altitudes. *Uromyces fabae* occurs on broad beans (*Vicia faba*) [ibid., vii, p. 558].

Late blight of potatoes (*Phytophthora infestans*) has been observed over the entire plateau, where it constitutes the limiting factor to the cultivation of this crop.

Ricinus communis, extensively planted by the natives and also growing wild, is heavily infected during the rains by a *Botrytis*, probably *B. cinerea*, which often causes complete defoliation.

Gibberella saubinetii occurs on maize throughout Guatemala; the fungus appears to cause little injury to the cobs but plays an important part in the etiology of seedling blight. *Physoderma zeae-maydis* and *Puccinia maydis* [*P. zeae*] have both been observed on maize but appear to be of slight importance. *Ustilago zeae* causes no appreciable damage to maize along the coast, but on the plateau, where the crop has been cultivated for centuries in biennial rotation with wheat or beans, it may reduce the yield by as much as 20 per cent.

BARAT (H.). **Études de la Division de Phytopathologie (Section Sud-Indochinoise de l'Institut des Recherches agronomiques) au cours de l'année 1930. II. Laboratoire de cryptogamie.** [Studies of the Phytopathological Division (South Indo-Chinese section of the Agricultural Research Institute) in the course of the year 1930. II. Cryptogamic laboratory.]—*Bull. Écon. Indochine*, N.S., xxxiv, pp. 779 B–796 B, September, 1931.

A series of epidemics marked the period under review, more especially among the coffee plantations of Annam and the rice fields of Cochin-China. Coffee was attacked by *Corticium* [*salmonicolor*: *R.A.M.*, x, p. 788] and *Colletotrichum coffeanum* [*Glomerella cingulata*: ibid., xi, pp. 159, 368, 370], the latter being particularly severe in Cochin-China, where it causes an extensive die-back of the plants from the upper part downwards.

A bacterial disease of the pseudo-stem of the Chuôi sù banana was observed in the Phan-Thiêt district. It was said to attack no other variety and to be less severe than the other bacterial diseases of the banana described elsewhere.

Sugar-cane is liable to the following diseases: smut (*Ustilago sacchari*) [*U. scitaminea*], which is more serious on the Formosa canes and those of the *Saccharum sinense* group than on the Bourbon and P.O.J. varieties; red rot (*C. falcatum*); 'banded sclerotial disease' [*Sclerotium* sp.: ibid., vii, p. 600 *et passim*], which occurred in a severe form in some late planted plots at the onset of the rainy season but was rapidly arrested with the onset of sunny weather; and red rot of the leaf sheaths [*S. rolfsii*: ibid., ix, p. 808], which only attacks the lowest four or five leaves and may thus be controlled by stripping the lower leaves. In one plantation in the province of Biên-Hoa the canes (imported from Java) suffered from a form of top rot associated with the presence of unidentified bacteria and of a species of *Fusarium*, probably *F. moniliforme* [*Gibberella moniliformis*], the causal organism of pokkah-boeng. *Coniothyrium sacchari* was found on canes harvested unduly late in the season.

Hevea rubber was affected by brown rot associated with forms of *Poria* and the incipient fructifications of a fungus probably identical with *Fomes lamaoensis* [ibid., xi, p. 72], but very few trees (1 in 10,000) were actually killed. *Sphaerostilbe repens* [ibid., ix, p. 405] was found in the plantings of budded stumps originating in Sumatra, which were placed in quarantine. This disease not having yet been reported in Indo-China, orders were given to burn the infected material and disinfect the soil. Brown bast was very prevalent, especially in old plantations. None of the treatments tried against this disease having proved economically feasible, the sole method of control is to leave the trees untapped for periods of six months to a year. Stripe canker [*Phytophthora* sp.: ibid., ix, p. 405] was also widespread but readily controlled. Numerous cases of die-back of rubber were observed, associated with *Gloeosporium albo-rubrum* [ibid., ix, p. 200], *Botryodiplodia theobromae* [ibid., ix, pp. 405, 675], and *Fusarium* sp. An account is given of the symptoms of a 'collar' disease of rubber grafts associated with *B. theobromae* which caused losses up

to 40 per cent. in 1930 [loc. cit.]. The disease presents close analogies with the 'sun scorch' of the lateral roots described by Sharples from Malaya [ibid., v, p. 761], and may be readily controlled by shading combined with irrigation. The multiplication and hypertrophy of the lenticels characterizing one phase of the disease appear to be connected with the presence of a *Gloeosporium*. A violent outbreak of the leaf disease due to *Helminthosporium heveae* [ibid., x, p. 685] was occasioned by the cold rains of December in nursery plantings.

Cinchona seedlings showing only the two cotyledonary leaves were attacked by a *Fusarium* which was apparently carried on the seed. *Rosellinia* sp. was found in the cracks on the collar and roots of one- to two-year-old *Cinchona* plants [ibid., ix, p. 161] on impermeable soil.

Rice suffered heavy damage from the attacks of *Sclerotium oryzae* [ibid., xi, p. 159] and *H. oryzae* [ibid., x, p. 759], the latter following the late, cold rains of December.

An epidemic of blister blight of tea (*Exobasidium vexans*) [ibid., ix, p. 144] occurred in the Kontum district. 'Scabbed leaf', characterized by the appearance on the upper leaf surfaces of tea of black (later grey), irregular spots, is believed to be due to an undetermined fungus, the mycelium of which disorganizes the palisade tissue.

STELL (F.). **Witch-broom disease of Cacao.**—*Proc. Agric. Soc. Trinidad and Tobago*, xxxii, 1, pp. 23–31, 1932.

Counts made on 26 representative estates in different parts of Trinidad and comprising an area of some 10,000 acres, bearing three million cacao trees, showed that in 1929 the number of trees infected by *Marasmius perniciosus* [*R.A.M.*, x, p. 658] was 6,080, in 1930 the figure was 18,078, and in 1931 it had risen to 58,000 or 2 per cent. of the whole. The disease is now present all over the island, having been reported on some 100,000 acres or half the total acreage under the crop.

A diseased twig or cushion or pod can produce eventually, if not destroyed, over one hundred mushrooms, each of which gives rise to between 20 and 30 million spores. Observations continued throughout one year on the experimental Marper estate (93 acres) in one of the most severely affected areas of the island showed that on an average three weeks elapse before brooms in the fresh, green stage become dry and brown, and that at least 14 weeks are required from its formation before the broom begins to produce sporophores. The broom may remain in position for 4 to 18 months or longer, producing successive crops of mushrooms. The main flushing period of cacao in Trinidad is in February and March, during which period the brooms are most numerous; later, but at periods varying with the year, the dry Indian summer, which also varies in duration, sets in, and the flush during this period is also accompanied by increased infection. Other minor flushes also occur annually, and are complicating factors.

In two complete working years, 1930 and 1931, the annual cost of removing and destroying witches' broom on the Marper estate

worked out at 6·8 dollars [= approximately £1 8s. 4d.] per acre. Lest this should be regarded as excessive the author points out that in Ecuador, where control is impracticable, *M. perniciosus* and *Monilia* [ibid., vi, p. 660; see also iv, p. 149] have in 10 or 12 years reduced the crop by fully 50 per cent.

At Marper, after two full years' eradication work, the number of sporophores found in December, 1931, averaged 2 per acre, whereas in a neighbouring plantation 610 per acre were found. Reinfection from outside is, thus, likely to complicate the control measures.

BAMBERG (R. H.). **The pathogenicity of Bacterium translucens var. undulosum.**—Abs. in *Phytopath.*, xxii, 1, p. 4, 1932.

Bacterium translucens var. *undulosum* [*R.A.M.*, xi, p. 163] has been found to infect oats, *Hordeum jubatum*, and *Bromus inermis* in addition to wheat, spelt, barley, and rye in Minnesota. Cultures obtained from rye and barley readily produced the typical black chaff lesions on wheat seedlings, the incubation period being 48 hours at 24° C. and 20 days at 10°. In the field in 1931, wheat plants were easily infected early and late in the growing season but not at midsummer. Wheat plants inoculated at the boot stage contracted infection on the leaves, awns, glumes, rachids, and necks. Infected areas on greenhouse plants became typically black, while most of those of plants kept at 10° and 20°, under artificial light, remained yellowish and water soaked. Four variants arising as sectors in cultures of the black chaff organism differed from the parents both culturally and in pathogenicity.

VANTERPOOL (T. C.) & TRUSCOTT (J. H. L.). **Studies on browning root rot of cereals. II. Some parasitic species of Pythium and their relation to the disease.**—*Canadian Journ. of Res.*, vi, 1, pp. 68–93, 2 pl., 8 figs., 1932.

Continued investigation of the root rot of cereals in Saskatchewan [*R.A.M.*, ix, p. 581] showed that, as indicated by the preliminary results, the condition is primarily due to the parasitic activity of certain species of *Pythium*, the more aggressive forms of which belong to the *Nematosporangium* group [ibid., xi, p. 129] of the genus, while the *Sphaerosporangium* forms are of little consequence. The most important of the parasitic species are a form considered to be new to science, which is named *P. volutum*; and another which, on the ground of its morphological details and pathogenic capacities, is provisionally identified as a variety of *P. arrhenomanes* [ibid., x, p. 180], *P. arrhenomanes* var. *canadensis* n. var. The latter was shown by comparative morphological, physiological, and pathological studies to be closely related to the Louisiana species causing a root rot of sugar-cane [ibid., viii, p. 740; ix, p. 271]. English diagnoses of these two organisms are given.

Of the two, *P. arrhenomanes* var. *canadensis* is the most widely distributed on wheat in Saskatchewan. When growing actively in the host tissues it produces terminal or intercalary, lobulate

sporangia, ranging from toruloid lateral buds to compound complexes, and provided with a discharge tube measuring up to 150 by 3 to 5 μ; discharge tubes are seldom formed on solid media but often in liquid ones. The zoospores, which vary in number from 3 to over 50 in a vesicle, are biciliate, deeply grooved at the hilum region, and measure about 12 μ when rounded up; they are monoplanetic and germinate by a single germ-tube. The oogonia are spherical to subspherical, terminal (rarely intercalary), the majority 27 to 40 μ diameter (average 33 μ) on carrot-cornmeal agar; in liquid cultures a bulbous swelling occasionally forms on the oogonial stalk near the oogonium. The antheridia are characteristically crook-necked, geniculate, or clavate; most commonly there are 3 to 6 antheridia to one oogonium, but as many as 12 have been counted, usually arising from neighbouring hyphae. The oospores are smooth, spherical to subspherical, light brown, usually completely filling the oogonium, and their average diameter is 31 μ. Controlled experiments indicated that this species may be as vigorous a parasite of wheat seedlings as *Helminthosporium sativum* or *Ophiobolus graminis*, and is much more aggressive than *Fusarium culmorum*. It was also shown to be capable of aggressive attack on the roots of oats, barley, rye, and maize.

P. volutum is apparently restricted to the Tisdale district in the park land and the Regina plains in the south. It has never been observed to form lobulate sporangia on solid media, but some were very occasionally seen in liquid media as lateral outgrowths or buds from the hyphae. The zoospores, which are not readily discharged, are biflagellate, bean-shaped, and 10 to 14 μ in diameter. The oogonia are smooth, subspherical, dark brown, terminal on short side stalks (rarely intercalary), and their average diameter is 30 μ. The antheridia (3 to 10 to each oogonium) are crook-necked, or sometimes curved or even straight, usually arising from adjacent hyphae or more rarely from the oogonial stalk. The oospores are smooth, spherical to oblong, usually free within the oogonium, and average 27·7 μ in diameter. In nature this species occurs on wheat and oats, and it was experimentally shown to be capable of parasitizing the roots of barley, rye, and maize.

Tests with *P. graminicolum* [ibid., viii, p. 34] from sugar-cane roots (received from Drechsler) showed that this species is only slightly parasitic on Marquis wheat.

The investigation indicated further that soil conditions (especially those following summer fallow) and seasonal climatic factors have a considerable influence on the incidence and severity of the root rot caused by these species of *Pythium*. Under experimental conditions the injury caused by them manifested itself as an embryo rot or pre-emergence killing of the cereal seedlings, post-emergence blight, or as retarded development throughout the life of the hosts. Both winter and spring wheats were shown to be susceptible. The damage caused to young wheat plants by *P. arrhenomanes* var. *canadensis* increased with increasing soil temperatures and moistures. No correlation was found between the hydrogen-ion concentration of the soil and the distribution of the disease, and no conclusive results have as yet been obtained as

to the effect of various fertilizers on the disease under controlled conditions.

PETIT (A.). **De la transmission des rouilles des céréales en Tunisie.** [On the transmission of cereal rusts in Tunis.]—*Ann. du Service Bot. de Tunisie*, vii, p. 111–130, 1 pl., 1931.

In Tunis the wheat rusts (*Puccinia* spp.) appear annually between 15th March and 1st April. No evidence has been found that the alternate hosts play any part in the development of rust on the cultivated cereals, and wheat protected from contact with dust in the atmosphere was never infected in the author's experiments, though the plants retained their susceptibility throughout growth and during all seasons. Plants grown from seed taken from wheat not rusted the previous year became infected directly they were placed in the open, while wheat grown in sterilized soil isolated from the outside atmosphere did not become infected. Uredospores and straw bearing sori were buried in soil in June and examined the following February, when none of the spores germinated. Heavy applications of cupric salts to the soil did not prevent the development of rust so long as the plants were exposed to the air. Sori bearing uredospores were noted on volunteer plants long before being seen in cereal fields; *P. graminis avenae* and *P. coronata* [*P. lolii*] were present on volunteer plants of cultivated oats one month after sowing. Spore traps exposed well before the appearance of rust in the field were found occasionally to catch spores resembling the uredospores of the cereal rusts. These are thought to have come from straw heaps in the neighbourhood. Rust was permanently present in wet localities where volunteer plants grew successively throughout the year, if during the spring the plants had borne uredospores. Stools of a highly susceptible variety were often severely rusted when others of the same variety, sown at the same time and in the same conditions except that they were sheltered from the wind, remained healthy if remote from foci of infection.

The author concludes that the cereal rusts are air-borne in Tunis and that uredospore infection chiefly from volunteer plants is an initial cause of an outbreak.

STAKMAN (E. C.), HINES (L.), UKKELBERG (H. G.), & BUTLER (W.). **Distribution of physiologic forms of Puccinia graminis tritici in the United States and Mexico in relation to rust epidemiology.**—Abs. in *Phytopath.*, xxii, 1, p. 25, 1932.

From 1929 to 1931, inclusive, 27 physiologic forms of *Puccinia graminis* [var.] *tritici* have been identified from about 1,650 collections made in the United States and Mexico [*R.A.M.*, ix, p. 233]. Forms 11, 21, 36, 38, and 49 were by far the most prevalent (average almost 90 per cent. of all collections) in each of the three years. Forms 49 and 38 were abundant in Mexico, the latter, which is only weakly pathogenic to the hard red spring wheats, constituting some 65 per cent. of all collections. On the other hand, forms 11, 21, and 36 were of very rare occurrence in Mexico. All these five forms were fairly widespread in the spring

in Texas, where some of them apparently overwintered in the uredo stage. The data from spore-trap exposures and observations on the northward spread of rust indicate that uredospores of these forms were carried northward from Texas by high winds. Abundant evidence is also available that much inoculum originated on barberries in the northern States [see next abstract].

WALLACE (J. M.). **Physiologic specialization as a factor in the epiphytology of Puccinia graminis tritici.**—*Phytopath.*, xxii, 2, pp. 105–142, 1 diag., 3 maps, 1932.

Much of the information in this amplified and fully tabulated account of the surveys made by the writer and his colleagues in 1926, 1927, and 1928 of the prevalence and distribution of physiologic forms of *Puccinia graminis tritici* in the United States has already been published [see preceding abstract *et passim*]. In 1926 the loss from black rust was insignificant and there was little evidence of south to north migration of forms affecting wheat, but in 1927 over 30 million bushels were destroyed by an epidemic in the spring wheat region, forms 18 and 21 being generally distributed in the northern Mississippi Valley and being also exceedingly common in Texas earlier in the season. In 1928 the incidence of infection was again much reduced, the total loss in the 13 barberry eradication States amounting to only 1⅓ million bushels: form 38, which appears to have originated in Mexico, was the most prevalent southern form. Attention is drawn to the value of such surveys in the study of the epiphytology of stem rust of wheat, the importance of an investigation of aecidial infections to supplement the field collections of uredospore material being emphasized. Fairly definite evidence has been obtained in recent surveys of the existence in the northern United States and Canada of certain physiologic forms probably perpetuated exclusively by means of barberries [see next abstract].

STAKMAN (E. C.), HINES (L.), COTTER (R. U.), & LEVINE (M. N.). **Physiologic forms of Puccinia graminis produced on Barberries in nature.**—Abs. in *Phytopath.*, xxii, 1, p. 25, 1932.

Many new physiologic forms of *Puccinia graminis* have been produced experimentally by hybridization between existing forms, and many segregates from certain 'selfed' heterozygous forms have been isolated from aecidia [*R.A.M.*, x, p. 365]. Presumably hybridization on barberries also occurs in nature. A survey was therefore made of varieties and physiologic forms of the rust occurring on barberries and neighbouring Gramineae with primary infection. All North American races or varieties of *P. graminis*, except *phlei pratensis*, develop readily on barberries, the following isolations having been made: 7 forms of *P. graminis secalis*; 17 of *P. graminis tritici*, of which 4 were previously unknown though one was subsequently found on wheat; and 3 of *P. graminis avenae*, of which one (form 8) has been found only on oats near barberry. New physiologic forms are evidently in course of production on barberries in nature, and since mutation in pathogenicity of *P. graminis* seems rare, barberry is apparently primarily responsible for the origin of these new forms.

NEATBY (K. W.). **Factor relations in Wheat for resistance to groups of physiologic forms of Puccinia graminis tritici.**—*Scient. Agric.*, xii, 2, pp. 130–154, 9 figs., 1931.

A full account is given of investigations carried out at Winnipeg to study the reaction of wheat hybrids to physiologic forms of *Puccinia graminis tritici* [see preceding abstracts] in order to ascertain (1) how many of these forms might be contained in a single group, the reaction to which appeared to be governed by a single factor pair; (2) to what extent a group identified in one cross might be found intact in another; and (3) to study the importance of such groups identified in the greenhouse in relation to field reaction.

The results obtained [which are tabulated and discussed] showed that the fifteen physiologic forms of *P. graminis tritici* the reactions to which of the cross Marquis × H–44–24 were studied fell into three groups, containing, respectively, seven, five, and three forms. Two sets of genetic factors were identified, one affecting the reactions to the forms in groups I and II, and a second affecting the reactions to the forms of groups I and III. Thus, the reactions of the cross to groups II and III are apparently controlled by a single set of factors, one for each group, while reaction to group I is affected by both sets of factors. In view of the results obtained by other workers with this cross [cf. *R.A.M.*, viii, p. 29] the author considers that each of the two sets of factors consists of only one pair.

In a study of Marquillo × H–44–24 fourteen physiologic forms were used, one set of factors being found to affect the reactions to all, but only two of the forms (group I) being, apparently, governed solely by these factors. A second set of factors affected the reactions to ten forms, which constitute group II. The reaction to form 29 was governed by the factors concerned in the reactions to the forms of group I plus an additional set of factors which may possibly be identical with some of the second set of factors concerned in the reaction to group II, or may constitute a third set. In Marquillo × H–44–24 the grouping of the forms was quite different from the grouping in the cross Marquis × H–44–24. No conclusion with regard to the number of factor pairs included in each set in the former could be drawn.

In the cross Garnet × Double Cross three groups of forms were identified, one containing five forms and the two others each containing two; the reactions were governed by two sets of factors, one affecting the reactions to the forms of groups I and III, and the second affecting those to the forms of groups II and III.

Experiments made to determine the effect of the factors concerned in the reaction of seedlings in the greenhouse in the resistance to stem rust in the field showed that selection on the basis of seedling reaction in the greenhouse was useless so far as Marquis × H–44–24 was concerned. With Marquillo × H–44–24, however, the factors governing the seedling reaction in the greenhouse were expressed in the field reaction. The results obtained from a field study of Garnet × Double Cross indicated that the factors concerned in the seedling reactions in the greenhouse did affect the field reactions in this cross, though the degree of the relationship

between the field and the greenhouse reactions could not be determined from the data available.

HARRINGTON (J. B.). **Predicting the value of a cross from an F_2 analysis.**—*Canadian Journ. of Res.*, vi, 1, pp. 21–37, 3 graphs, 1932.

The author states that as a result of extensive breeding work, in which he attempted to combine the stem rust (*Puccinia graminis tritici*) resistance of Marquillo wheat with the many desirable agricultural qualities of the rust-susceptible Marquis [cf. *R.A.M.*, viii, p. 29], from an initial F_2 population of about 40,000 plants, only six lines remained in the F_6 generation which showed a promise of achieving the desired combination, and none of these lines was entirely satisfactory. This disappointing result led him to investigate the possibility of predicting the final value of a cross by a detailed analysis of the behaviour of individual plants in the F_2 generation, for which purpose he used a remaining lot of F_2 grain of the Marquillo × Marquis cross. The figures obtained by the statistical method [some details of which are given] in this study agreed well with those that were observed during the long and laborious practical work, indicating the advisability of subjecting a preliminary population of several hundred F_2 plants to critical analysis for all important characters before undertaking extensive work on a cross. The study also indicated that genetic linkage may be concerned with respect to factors governing rust reaction, seed appearance, and crumb colour.

PETERSON (R. F.). **Stomatal behaviour in relation to the breeding of Wheat for resistance to stem rust.**—*Scient. Agric.*, xii, 3, pp. 155–173, 4 figs., 1931.

Leaves of seven [named] standard susceptible and resistant varieties of wheat as well as of susceptible and resistant hybrids from H–44 × Reward and H–44 × Renfrew were studied microscopically in the field at Winnipeg to ascertain whether the rate of stomatal opening in the morning is correlated with the amount of infection by *Puccinia graminis tritici* [cf. *R.A.M.*, ix, p. 295]. It was observed that while the standard varieties showed some differences in their stomatal behaviour these differences were insufficient to account for the variations in rust reaction and some did not bear out the functional resistance theory [loc. cit.], the stomata of the two durum varieties Pentad and Mindum, for example, at comparable stages of growth, behaving alike, although Pentad is resistant and Mindum susceptible. Only slight differences in stomatal behaviour were noted as between the different hybrid strains, and these appeared to be unrelated to rust reaction.

Marquis and H–44 plants inoculated with *P. graminis tritici* form 9 and incubated in the dark showed marked differences in their respective rust reactions. These differences, being independent of the stimulus of light, were not due to functional resistance. The type of reaction shown by H–44 indicated that this variety possesses in the heading stage a physiologic resistance to form 9 which it does not possess in the seedling stage.

When hybrids of H–44 × Marquis and Pentad × Marquis were

sprayed with soft water in the morning to prolong the dew period, the amount of infection was not increased.

It is concluded that the main resistance of H–44, Hope, and Pentad wheats is not due to stomatal behaviour.

CALDWELL (R. M.) & STONE (G. M.). **Appressorium formation and penetration by leaf rust of Wheat, Puccinia triticina, in relation to stomatal aperture.**—Abs. in *Phytopath.*, xxii, 1, pp. 5–6, 1932.

By stripping the epidermis from wheat seedling leaves inoculated with leaf rust (*Puccinia triticina*) [*R.A.M.*, xi, p. 231], fixing, staining, and mounting it in absolute alcohol, the relation of the stomatal aperture at the time of penetration to the entrance of the fungus into the host may be directly observed. The formation of an appressorium over an open stoma apparently stimulates it to close tightly, but the closed stomata offer no impediment to penetration and on the living plants a small stomatal slit may often be seen between the appressorium and the substomatal vesicle, apparently caused by the penetration tube pushing between the guard cells.

On inoculation on wheat leaves, *Uromyces fallens* [ibid., viii, p. 176] penetrated abundantly and behaved identically with *P. triticina* in relation to the stomata.

CALDWELL (R. M.), KRAYBILL (H. R.), SULLIVAN (J. T.), & COMPTON (L. E.). **The effect of leaf rust, Puccinia triticina, on the composition and yield of winter Wheats in 1931.**—Abs. in *Phytopath.*, xxii, 1, p. 5, 1932.

Yield data and chemical analyses of the plants and grain were secured from replicated plots of severely leaf-rusted (with *Puccinia triticina*) and nearly rust-free winter wheats of eight varieties at La Fayette, Indiana, in 1931. Practically rust-free control plants were obtained by sulphur dusting. The rusted plots consistently yielded a lower protein content and much less vitreous grain than the controls, but the vegetative portions of the rusted plants were higher in total nitrogen. The latter were lower in reducing sugars, sucrose, and starch. Significant reductions in yield of grain and straw, test weight per bushel, weight of 1,000 kernels, and number of kernels to the head were observed in the diseased plots. In the susceptible Michigan Amber variety, where four degrees of rust severity were secured by variations in the dusting procedure, the above-mentioned trends were evidenced in approximate proportion to the incidence of infection.

FLOR (H. H.). **Heterothallism and hybridization in Tilletia tritici and T. levis.**—*Journ. Agric. Res.*, xliv, 1, pp. 49–58, 1932.

Continued experiments on the lines indicated in a previous communication [*R.A.M.*, x, p. 372] are stated to have definitely established that both *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*] are heterothallic. The tests included three physiological forms of *T. caries* and two of *T. foetens* [cf. ibid., xi, p. 33] which were shown to comprise an as yet undetermined number of sex

groups. The members of these groups are specific, for in no instance was a member of one group able to cause infection of the wheat seedlings when paired with a member of a similar group. It is pointed out, however, that membership within a sex group was not confined to a particular physiological form or even to the respective species, since compatible sex groups of *T. caries* and *T. foetens* readily paired with each other, thus providing ample opportunity for hybridization in nature. The spores produced by this species-cross were identical in appearance with those of *T. foetens*: they were ellipsoidal and slightly angular in shape, and their epispore wall was smooth. The investigation also provided evidence that by adequately pairing the monosporidial cultures of these fungi it should be possible to develop pathogenically pure lines of both species.

DOUNINE (M. S.) & SIMSKY (A. M.). **Haftfähigkeit der Trockenbeizmittel.** [Adhesiveness of dusts.]—*Angew. Bot.*, xiv, 1, pp. 33–78, 1932.

A detailed and fully tabulated account is given of the writers' experiments to determine the adhesiveness to cereal seeds of a number of dusts, viz., $NaAs_2O_3$, $CaAs_2O_3$, Paris green, potassium bichromate, copper carbonate, and malachite [cf. *R.A.M.*, x, pp. 228, 475]. The adhesiveness of the preparations was determined mainly by Hilgendorff's method [ibid., ix, p. 707] or modifications of this, and was found to bear a relation to their specific gravity, being greatest in those with a relatively low specific gravity, e.g., $NaAs_2O_3$ (sp. gr. 2·78). By passing the dusts through a sieve with 3,600 meshes per sq. cm. their adhesiveness may be increased by 15 per cent. as compared with the unsifted dust, the corresponding figures for 6,400 meshes being 30 per cent. With an increase in the dose of the fungicide from 0·05 to 0·3 per cent. the difference in the relative adhesiveness of the differently sized particle fractions of the dusts became much less marked. The adhesiveness of the dusts was found to vary with the different seeds on which they were used. The highest degree of adhesiveness in $NaAs_2O_3$ and Paris green (the most adhesive of the preparations tested) was secured by adjusting the velocity of the mixing apparatus (Ideal No. 1) to 30 to 60 rotations per minute; at a speed of 60 to 75 rotations per minute adhesiveness decreased considerably. The length of time required for mixing the dusts with the seed in such a way as to secure maximum adhesiveness ranged from 10 or 20 minutes for $NaAs_2O_3$ and Paris green to 30, 40, or even up to 70 minutes for the other, less adhesive preparations used in the tests. Strongly hygroscopic dusts, e.g., $NaAs_2O_3$, were found to increase in adhesiveness with an increased moisture content of the seed (oats).

The addition of field dust to the various preparations with a view to augmenting their adhesiveness was found to produce a directly opposite effect, especially in the cases of potassium bichromate and calcium arsenate. It is very important, therefore, that the seed should be freed as far as possible from dust and other soil particles before treatment. Generally speaking, the addition to the dusts of various neutral substances ('fillers'), e.g., chalk, talc, dextrin, and coal dust, caused a decline in adhesiveness. The adhesiveness of

the dusts tested (calcium arsenate, copper carbonate, and Paris green) to wheat seed-grain was found to increase in proportion to the extent of infection by bunt [*Tilletia caries* and *T. foetens*], reaching 88·78, 77·40, and 97·72 per cent., respectively, with 1 per cent. infection compared with 53·90, 66·17, and 75·20 with non-infected seed-grain.

ARNAUD (G.) & GAUDINEAU (Mlle M.). **Le traitement de la carie du Blé.** [The treatment of Wheat bunt.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 6, pp. 208–214, 1932.

The best results in the control of wheat bunt [*Tilletia caries* and *T. foetens*] in France were obtained during 1930–1 (a year with no unusual weather conditions) by the following treatments [cf. *R.A.M.*, x, p. 303]: 20 minutes' immersion in 0·25 per cent. formalin; one hour in 0·5 per cent. copper sulphate, followed by dusting with powdered lime; one hour in caseinated Bordeaux mixture, preceded by washing the seed-grain in water; and dusting with cupric chloride or copper oxychloride (slightly less effective than the foregoing) at 0·2 per cent. by weight of the grain treated. Generally speaking, the highest incidence of infection was found in the November and December sowings. Virtual immunity from bunt characterized the Red Hussar and Ridit varieties, while Blé de Pologne and Florence 135 showed a high degree of resistance. The most susceptible varieties were Ardito précoce, B2, Hybride 40, Carlotta Strampelli, Saisette du Maninet, and Bon Fermier.

PETIT (A.). **Le traitement de la carie du Blé et la préservation des grains vis-à-vis des insectes parasites.**—[Wheat bunt treatment and seed preservation from parasitic insects].—*Ann. du Service Bot. de Tunisie*, vii, pp. 95–100, 1931.

Laboratory tests [which are briefly described and the results of which are tabulated] and inquiries among growers were made to ascertain whether wheat seed treated with cupric powders [against *Tilletia caries* and *T. foetens*] was preserved from insect attack when stored from one season to the next without treatment by carbon bisulphide. It was shown that this was so when the seed was treated with powdered pure mercury salts, e.g., calomel [mercurous chloride] at the rate of 250 gm. per quintal, and also with various salts of copper such as the carbonate when mixed with 5 to 20 per cent. of a mercury salt such as calomel or corrosive sublimate [mercuric chloride]. Pure copper salts under certain conditions protected the seed against insect attack for periods apparently exceeding six months. When cupric powders containing only a small amount of the metal were used, as a rule no protection resulted. Lead and copper arsenates and pyrethrum powder had no lasting effect.

PETIT (A.). **Observations sur la carie du Blé.** [Observations on Wheat bunt.]—*Ann. du Service Bot. de Tunisie*, vii, pp. 101–103, 1931.

Experiments with a Tunisian strain of *Tilletia levis* [*T. foetens*], a southern European strain of *T. tritici* [*T. caries*], and three distinct strains of wheat bunt received from Dr. Jaczewski showed

that any variety of wheat highly resistant to any given strain of bunt is generally equally resistant to any other strain of either organism. Also, a wheat variety often shows the same degree of susceptibility to several different strains, and this susceptibility remains unchanged from one year to another. Various antiseptics had the same effect on all five strains; dusts with a basis of cupric chloride (10 to 15 per cent.) or cuprous chloride gave particularly good control. In tests with bunt the most important factor is the degree of susceptibility of the wheat, the virulence of the parasite varying little.

The fungicidal action of the so-called insoluble salts is explained (*a*) by chemical change, oxidation and the formation of soluble salts, and (*b*) by their becoming soluble owing to the presence of amines. The former process occurs with cuprous chloride and calomel [mercurous chloride], which produce, respectively, the highly soluble cupric chloride and soluble mercuric chloride, while the copper sulphides are rapidly changed into pentahydrated sulphate; the latter process takes place with copper phosphate, copper carbonate, copper arsenite, and lead arsenite.

Only copper arsenite is capable of sterilizing bunt spores in the soil so that they fail to contaminate the young wheat, though lead arsenite seems to approach it in this respect. The sterilizing action of the former is apparent even with a dose as minute as 250 gm. per hect.

PETIT (A.). **Observations sur le charbon du Blé (Ustilago tritici).** [Observations on loose smut of Wheat (*Ustilago tritici*).]—*Ann. du Service Bot. de Tunisie,* vii, pp. 105–109, 1931.

When healthy seed from a single ear of Mahon and Baroota wheat partially affected by loose smut (*Ustilago tritici*) was grown on exposed to natural infection, the disease was apparently absent in the former variety until the F_3 generation, while in the latter variety it reappeared in the F_4 generation. Similar results were obtained with bunt [*Tilletia caries* and *T. foetens*], when by selecting seed from resistant stools the F_2 generation showed 20 per cent. infected ears, as compared with 80 per cent. in the controls, but in the F_3 generation no difference could be detected between the two. It is concluded that in such cases no hereditary acquired immunity has been developed.

Under Tunisian conditions it was not found possible to substitute exposure to sunlight for the hot-water seed treatment against loose smut.

HANNA (W. F.) & POPP (W.). **Physiologic forms of loose smut of Wheat.**—Abs. in *Phytopath.*, xxii, 1, p. 11, 1932.

Two distinct forms of loose smut of wheat (*Ustilago tritici*) have been found in Manitoba [*R.A.M.*, ix, p. 190]. One, collected on Reward wheat, produces severe infection on many of the common wheats but failed to attack the durum varieties, Mindum and Pentad. The other, collected on Mindum, is pathogenic to the durums, while the common wheats tested showed moderate resistance to it.

RATHSCHLAG (H.). **Vorkommen und Verbreitung der Fusskrankheitserreger in der Börde im Jahre 1930–31.** [Occurrence and distribution of the causal organisms of foot rot in the Börde during the year 1930–31.]—*Angew Bot.*, xiv, 1, pp. 28–33, 3 figs., 1 graph, 1932.

According to Schaffnit, *Ophiobolus graminis* is by far the most important agent of foot rot of cereals in Germany [*R.A.M.*, ix, p. 586]. During 1931 the writer conducted a series of experiments in Saxony to determine if this were true under local conditions.

In Petri dish cultures on oatmeal agar, *Fusarium culmorum* was isolated from the haulms of 76·4 per cent. of the samples of winter barley and *F. nivale* [*Calonectria graminicola*: ibid., xi, p. 228] from 15·5 per cent., the corresponding figures for winter and summer wheat being 56·3 and 15 per cent., respectively. As it was thought that the luxuriant mycelial growth of these fungi might have prevented the detection of *O. graminis* and *Leptosphaeria herpotrichoides*, the plants were replaced in the soil and re-examined some weeks later. *O. graminis*, however, was only found on 7 out of 106 haulms, while *L. herpotrichoides* was absent.

At the time of maturation of the plants, the macroscopic symptoms generally give a clue to the identity of the attacking fungus. Infection by species of *Fusarium* is characterized by a brown discoloration of the stem base, and the roots are fairly resistant to pulling, whereas in invasion by *O. graminis* the haulm bases are deep black and the plants are readily extracted from the soil. In the Börde, however, the economic importance of *O. graminis* is slight owing to its scarcity.

Observations on cereals in the field in the spring and autumn indicated that young plants are only liable to attack by the foot-rotting fungi when grown under unfavourable conditions. As a rule, conspicuous symptoms do not appear until the plants are approaching maturity.

BOCKMANN (H.). **Ein Beitrag zur Biologie und wirtschaftlichen Bedeutung des Erregers der Braunfleckigkeit des Weizens: Macrophoma hennebergii (Kühn).** [A contribution to the biology and economic importance of the causal organism of brown spotting of wheat: *Macrophoma hennebergii* (Kühn).]—*Angew. Bot.*, xiv, 1, pp. 79–86, 1932.

During the long spell of wet weather in July, 1931, the Schleswig-Holstein wheat crops were severely attacked by *Septoria nodorum* (*Macrophoma hennebergii*) [*R.A.M.*, vi, pp. 146, 464], which causes a dark chocolate-brown spotting of all the aerial parts of the plant, especially the glumes. About three weeks after infection the minute dark pycnidia appear on the spots. The spores are surrounded by a thin mucilaginous sheath which serves to attach them to the substratum.

Laboratory tests in 1930 and field experiments in 1931 indicated that the pycnospores of *S. nodorum* are not disseminated by wind, which appears to hinder rather than promote infection, by drying the plants and so depriving the spores of the moisture essential for their germination. The present researches have shown conclusively that epidemic outbreaks of brown spotting are confined to damp

seasons, when the causal organism attacks both healthy and constitutionally enfeebled plants, such as those damaged by lodging. A serious reduction of yield is only to be anticipated in the latter case. The disease may best be combated by the avoidance of the various factors tending to disturb the normal development and equilibrium of the plants, e.g., the unbalanced use of nitrogen.

CHRISTENSEN (J. J.) & GRAHAM (T. W.). **Physiologic specialization in Helminthosporium gramineum.**—Abs. in *Phytopath.*, xxii, 1, p. 6, 1932.

Eighty-four out of 226 monospore cultures of the barley stripe organism, *Helminthosporium gramineum*, isolated from 76 different collections, were culturally distinct [*R.A.M.*, x, p. 232]. Forty-nine of these were obtained from Minnesota and the rest from various parts of the United States, Canada, and Germany. With two possible exceptions, a distinct cultural race was secured from each collection. Occasionally two different races were isolated from a portion of a diseased leaf. The percentage of infection produced by 75 different races on several barley varieties ranged from 0 to 90. Generally speaking, the varieties ordinarily susceptible in the field were heavily attacked by a large number of races in artificial inoculation experiments, but some of these varieties proved susceptible to certain races and not to others.

REED (G. M.). **Inheritance of resistance to loose and covered smut in a hybrid of Early Gothland and Victor Oats.**—*Amer. Journ. of Botany*, xix, 2, pp. 194–204, 1932.

The writer here expands and tabulates the results of his studies from 1927 to 1931 on the inheritance of resistance to the loose and covered smuts of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]) in oat hybrids between the Early Gothland and Victor varieties [*R.A.M.*, viii, p. 487; ix, p. 520]. With loose smut, both the F_2 and F_3 generations showed practically complete susceptibility, while with covered smut there was a marked preponderance of resistant plants in the F_1, F_2, and F_3 generations. In regard to the latter smut, resistance is clearly dominant and segregation occurs in the second generation.

BARGER (G.). **Ergot and ergotism. A monograph based on the Dohme lectures delivered in Johns Hopkins University, Baltimore.**—xvi+279 pp., 6 pl., 23 figs., 1 graph, 2 maps, London and Edinburgh, Gurney & Jackson, 1931.

This interesting monograph on ergot (*Claviceps purpurea*) and ergotism comprises sections on the following aspects of the subject. Chapter I is devoted to the history of ergot from the earliest times, including notes on the distribution of rye, the various names applied to ergot in different languages, and its introduction into medicine. Chapter II deals with epidemics of gangrenous and convulsive ergotism in various countries, citing numerous references to the disease from ancient writers and those of the Middle Ages and modern times. In Chapter III the botanical side of the subject is considered under the headings of history, characters of the sclerotium, life-cycle, ergot in relation to agriculture, species of

Claviceps, hosts of *Claviceps* [a list of which is given], and biological races. Chapter IV deals with the chemical constituents of ergot in two groups, viz., those peculiar to ergot, namely, ergotinine and ergotoxine, ergotamine and ergotaminine [cf. *R.A.M.*, xi, p. 103], and those not peculiar to ergot. Chapter V discusses the pharmacological and clinical, and Chapter VI the pharmaceutical and forensic aspects of ergotism.

A bibliography of over 40 pages is appended.

IVANOFF (S. S.). **Stewart's disease of Corn.**—Abs. in *Phytopath.*, xxii, 1, pp. 13–14, 1932.

The causal organism of Stewart's disease of maize (*Aplanobacter stewarti*) [*R.A.M.*, x, p. 238] has been found to enter the roots of plants grown in artificially infested soil through wounds inflicted artificially or by the agency of grubs. Histological and isolation studies showed that in the leaf tissue the bacteria escaped from the vessels and entered the parenchyma, causing discoloration, plasmolysis, and death of the cells. In the kernel the bacteria were observed in the vessels and in the adjoining cavities of the chalazal region, between the testa and the aleurone layer, and between the endosperm cells. In the tassel *A. stewarti* was detected in the vessels of rachids, rachillas, glumes, and filaments. The bacteria were isolated from the exudate on leaves and the water at the base of the unfolding leaves, from the glumes, anthers, and pollen of diseased plants, and from maize stubble overwintered in the field. A selective medium was developed with which the organism was isolated from the soil.

STANLEY (A. R.) & ORTON (C. R.). **Bacterial stalk rot of sweet Corn.**—Abs. in *Phytopath.*, xxii, 1, p. 26, 1932.

The bacterial stalk rot of maize caused by *Bacterium dissolvens* [*R.A.M.*, viii, p. 28] appeared in epiphytotic form in the Ohio Valley in West Virginia, during 1930 and 1931, the Golden Bantam and a number of other varieties [which are listed] being attacked. Needle-prick inoculations on young maize stalks result in the rapid invasion of the parenchyma, a watery brown discoloration and softening of the tissues, and crumpling of the stalks. The numerous strains that were isolated are motile in broth cultures and produce H_2S on lead acetate agar but no indol in tryptophane broth. A striking similarity with *Bacillus carotovorus* was found.

MOORE (M. B.). **The genetics of Ustilago zeae.**—Abs. in *Phytopath.*, xxii, 1, p. 20, 1932.

A study was made of the gametic (F_1) segregates from crosses between one monosporidial line of *Ustilago zeae* [*R.A.M.*, xi, p. 363] and each of two others with contrasting cultural characters. All the F_1 lines isolated from the two crosses fell into 17 cultural groups, 49 from one cross falling into 12 and 38 from the other into 13 groups. A few F_1 lines were almost identical with one or another of the parental lines. All the characters studied, including sex, were apparently governed by multiple factors. The segregation of factors for cultural characters occurred in the second division of the fusion nucleus or began in the first and was completed

in the second; occasionally this process may have taken place in still later divisions. Three different combinations of the F_1 lines from a single smut spore varied greatly in their capacity to form spores on maize plants, though all produced abundant galls consisting of mycelium and hypertrophied host cells. The number of spores formed varied with the maize variety inoculated. One combination which produced numerous large galls formed only a few spores in occasional galls.

DAVIS (G. N.). **Relation of axillary-bud development to nodal smut infection in the Corn plant.**—Abs. in *Phytopath.*, xxii, 1, pp. 7–8, 1932.

Eight hundred maize plants were used to determine the relationship between axillary bud development and the appearance of nodal smut [*Ustilago zeae*] boils [*R.A.M.*, ix, p. 237], 400 being inoculated on 13th June and smut readings taken on 21st August. On 22nd August, 100 of these plants were injured by removing the ears, another 100 by removing the tops, and 100 by removing both, while 100 were left uninjured as controls. Four hundred uninoculated plants were similarly treated. Final smut readings were taken on 16th September. In the inoculated plants nodal infection in the uninjured controls increased by 20·5 per cent. between 21st August and 16th September, while the removal of tops and ears resulted in increases of infection of 29 and 63 per cent., respectively, over the controls, the corresponding figures for the removal of both tops and ears being 52·2. In the uninoculated series nodal infection in the uninjured controls increased by 33·3 per cent. in the same period, removal of tops resulted in 43·7 per cent. increase, removal of ears 56·2 per cent., and removal of both 36·8 per cent. Seven out of 10 axillary buds from sweet maize were found to contain smut mycelium ten days after inoculation, while 110 days after inoculation 66 per cent. of the apparently healthy buds from ten of the plants showed small mature smut boils when held before a strong light.

HOPPE (P. E.), HOLBERT (J. R.), & DICKSON (J. G.). **The relation of maturity of seed to seedling-blight susceptibility in Dent Corn.**—Abs. in *Phytopath.*, xxii, 1, p. 12, 1932.

Investigations in Wisconsin have shown that the environment during the growth and maturation of the mother plants of Dent maize greatly affects the disease reaction of seedlings of the subsequent crop when inoculated with *Gibberella saubinetii* [*R.A.M.*, x, p. 724], apart from the genetic potentiality for resistance in the strains. Experimental data on the seed from several hundred self-pollinations in inbred lines further indicated that resistance to seedling blight increased with the maturity of the parent seed. The rates of increase in resistance, however, varied at the different stages of maturation of the parent seed.

MCNEW (G. L.). **Parasitism of Diplodia zeae on the crown of the Corn plant.**—Abs. in *Phytopath.*, xxii, 1, p. 18, 1932.

On land previously sown with maize, plants from nearly disease-free seed showed 12 per cent. collar infection with *Diplodia zeae*,

which was present to the extent of 18 per cent. in those from treated infected seed [*R.A.M.*, x, p. 785]. All the plants grown in steamed soil to which cultures of *D. zeae* were added contracted infection, which was reduced and delayed when the soil was infested later in the growing season. At maturity 80 per cent. of the plants showing heavy infection of the crown were invaded to the second internode. Under similar conditions but omitting the inoculum, the same symptoms developed on plants from seed naturally infected by *D. zeae.* A series of plants with 81 per cent. mesocotyl infection but no seedling blight showed 80 per cent. collar infection at maturity. The fungus enters the collar either from the soil or from the infected seed. Root reduction due to collar infection was experimentally shown to be greatest in compost soil at 45 per cent. of the water-holding capacity.

Reddy (C. S.). **Basisporium dry rot of Corn.**—Abs. in *Phytopath.*, xxii, 1, pp. 22–23, 1932.

Injury by *Basisporium gallarum* [*Nigrospora sphaerica*: *R.A.M.*, xi, p. 297] is associated with cessation of translocation and occurs at the time of germination, after normal maturity, and in cases of premature death from cold or other causes. Infected seed dies within a few days after planting in soils slightly below the temperature range for germination, the germ being killed by the fungus before active translocation begins. Seed treatments are most beneficial under conditions of greatest injury by *N. sphaerica*, e.g., where the soil is cold at the time of germination. Seed-maize strains germinating readily below 11° C. are little affected by *N. sphaerica.* Artificial inoculation tests showed that natural inoculum was widespread at the time of earing, the number of infected ears not being appreciably increased by artificial wound inoculations. With or without the latter, susceptible ears became infected while resistant ones did not. Resistance in the ears was found to be correlated with a high hydrogen-ion concentration in the cobs—an inherited character that may well be utilized in breeding for resistance to this type of ear rot.

Melchers (L. E.), Ficke (C. H.), & Johnston (C. O.). **A study of the physiologic forms of kernel smut (Sphacelotheca sorghi) of Sorghum.**—*Journ. Agric. Res.*, xliv, 1, pp. 1–11, 2 figs., 1932.

This report embodies the results [presented in tabular form] of the authors' studies from 1927 to 1929, inclusive, at the Kansas Agricultural Experiment Station, of the specialization of covered kernel smut of sorghum (*Sphacelotheca sorghi*) [*R.A.M.*, xi, p. 235]. The tests, which comprised 80 [named] varieties, selections, and hybrids covering the various groups of sorghums, showed the existence, besides the three physiological forms previously recorded [ibid., ix, p. 644], of two additional forms, namely, form 4 which differs from form 1 in its reaction on White Yolo (K.B. 2525), and form 5 differing from form 3 in its reactions on three differential hosts [which are listed]. They also indicated that a number of varieties, selections, and hybrids which formerly were considered to be highly resistant to or immune from the smut, are really somewhat

susceptible to one or more of the physiological forms, a fact which has considerably complicated the problem of breeding for resistance to the disease.

Comparative morphological studies in 1929 showed that the sori of the five forms exhibit some rather definite differences in their length, colour, and manner of rupturing. While these differences may be helpful in making tentative identifications, it is still doubtful whether the forms can be separated solely on this basis. There was evidence that form 1 is most common and widely distributed in the United States; form 2 is of rarer occurrence, and definite information is still lacking as to the distribution of forms 3, 4, and 5. Experiments during several years have established that all the five forms of *S. sorghi* are effectively controlled by dusting the seed-grain with copper carbonate, a method which is almost exclusively used in Kansas.

Cocchi (F.). **Un marciume dei Limoni dovuto a Pleospora herbarum (Pers.) Rabenh.** [A rot of Lemons due to *Pleospora herbarum* (Pers.) Rabenh.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 3, pp. 179–213, 1 col. pl., 12 figs., 1931.

From a Sicilian lemon the author in January, 1931, isolated the conidial stage (*Macrosporium commune*) of *Pleospora herbarum*, which he states has not previously been recorded on citrus fruits, his organism differing from that recorded in Fawcett and Lee's book [*R.A.M.*, v, p. 735] in the readiness with which it formed conidia on various media, and being also quite distinct from *P. hesperidearum* Catt. [ibid., ix, p. 106]. The lesions caused [which are depicted in colours] were superficially almost indistinguishable from those produced by *Alternaria citri*, and when further isolations were made from lemons showing apparently similar lesions an *Alternaria* was constantly present in the cultures.

Owing to insufficient naturally infected material, the progress of the disease was studied on artificially inoculated lemon fruits. Eight or ten days after a fragment of mycelium from pure culture had been inserted through a wound in the skin, the surface round the wound became wrinkled and dark; if the temperature was sufficiently high the spot grew larger and darker daily, and on attaining a diameter of 2 or 3 cm. it consisted of a dark brown centre surrounded by a lighter halo. The centre then turned black and often became covered with a greyish, later dark green mould. The attack was most rapid when the inoculation was made near the apex of the fruit, otherwise the appearance of external symptoms was much retarded, though the fungus continued to spread in the tissues. In the inoculations near the middle of the fruit symptoms were first visible after about six weeks but then developed rapidly so that some five days later the distal half of the fruit turned brown and the surface of the lesion around the point of inoculation, which was slightly wrinkled, showed the characteristic greyish-green mould. The diseased area remained firm and did not become soft.

Perithecia were not found on fruits inoculated a few months previously, but developed on carrot in a little more than a month. The morphological characters [which are described] establish clearly

their identity with those of *P. herbarum* and remained fairly constant on numerous media. On carrot and potato a slight rose pigmentation was formed, but disappeared as the colony darkened; on potato glucose agar the rosy colour was more intense and remained permanently. The P_H value of the medium did not affect the production of this coloration. Growth was best on acid media.

For infection to take place lesions in the skin appear to be necessary. The conidia showed great resistance to various fungicides. The only satisfactory method of control appears to lie in improved cultural practices.

Black spot of Citrus.—*Fruit World of Australasia*, xxxiii, 2, p. 76, 1932.

While there is no outward sign of black spot [*Phoma citricarpa*: *R.A.M.*, x, pp. 161, 223] on oranges in New South Wales before September or October of the year following infection, it has been ascertained that the fruits become infected at and after blossoming. Experimental evidence was obtained that almost complete control (a reduction in the percentage of spotted fruits from nearly 100 to 5) follows two applications of Bordeaux mixture 6–4–80 plus half a gallon of red spraying oil per 80 galls. (applied under a pressure of about 250 to 300 lb.) made when about half the blossom has fallen and again six to eight weeks after blossoming. Every effort should be made to keep the young, developing fruit well covered with spray and in some seasons three applications should be given, the first as above, the second five weeks later, and the third five weeks after the second.

Reports received from Experiment Stations, 1930–1931.—242 pp., 2 diags., 51 graphs, 1 plan, London, Empire Cotton Growing Corporation, 1932.

This compilation of the reports for the season 1930–1 received from various cotton-growing stations of the British Empire [cf. *R.A.M.*, x, p. 594] contains, among others, the following items of phytopathological interest.

Arrangements were made for all the more important new strains growing at the experimental farm at Shambat (Sudan) to be tested at the research farm at Wad Medani in the Gezira for resistance to leaf curl [ibid., xi, pp. 176, 238 and next abstract] and blackarm disease [*Bacterium malvacearum*]. Three fixed Sakel Sea Island hybrids are being propagated, two of which, XH 1029 and XH 1229, are highly resistant to leaf curl and are considered to be possible alternatives to the susceptible Sakel cotton at present grown in that area. Shambur Sakel IV, which was recently tested on a large scale for the first time, is being propagated in view of its resistance to leaf curl and the excellent yield results obtained in the Shambat variety test. The 'Egyptian line test' at Shambat included several new types from Egypt as well as many new strains; nine of the varieties tried gave indications of being higher yielders than Sakel and several were highly resistant to leaf curl.

In 1930, blackarm was bad in the earliest stages in some parts of

the farm at Shambat and a propagation area of Sakel 186 was almost killed out; all the plants which were not actually killed by the disease rapidly recovered, however, when the rains ceased, and the final effect on the general crop must have been very slight. Leaf curl appeared towards the end of September at roughly the same date as in the Gezira area. The disease undoubtedly somewhat reduced the final yield at Shambat, but apparently unaffected plants also gave poor final yields, and the author is of the opinion that factors other than blackarm and leaf curl are of primary importance at Shambat. All the observations made showed that the poor yield obtained was due in the first place to some factor adversely affecting flower production in October and November.

In the cotton breeding plot at Bukalasa, Uganda, owing to the importance of blackarm as a limiting factor in yield in certain years [ibid., xi, p. 353], very close attention was paid during the period under review to the spread of the disease and the resistance offered to it; weekly counts of leaf spot infection were made as long as the size of the plants allowed this to be done accurately. Infection varied greatly in intensity with the varieties planted, and definite degrees of resistance were observed. Thus, three families of S.G. 99 (Allen var.) gave 100 per cent. infection in the first two weeks, while B. 31 remained completely resistant throughout the season. The angular leaf spot form of the disease appeared in August about three weeks after planting and spread rapidly until about 80 per cent. of the crop was affected. The blackarm form, however, was negligible. To ascertain the effect of the change of seed in the Teso and Lango districts [loc. cit.], Local N. 17 and Busoga N. 17 were included in three trials in Teso and one in Lango. The germination was in favour of the Busoga seed at all centres, this seed being about 8 per cent. better in this respect than Local seed. There appeared to be no difference between the two as regards angular leaf spot infection. The final yields showed no significant differences whatever.

VAGELER (P.) & ALTEN (F.). **Böden des Nil und Gash V.** [Soils of the Nile and Gash V.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde,* xxiii, 3–4, pp. 149–207, 14 figs., 6 diags., 2 graphs, 2 maps, 1932.

In connexion with an exhaustive survey of the physical and chemical properties of the Nile and Gash soils the writers state that the sensational fall in the cotton yields of the Gezira during the past year is primarily attributable to two diseases, viz., blackarm (*Pseudomonas* [*Bacterium*] *malvacearum*) and leaf curl [see preceding and next abstracts], both of which assumed epidemic form. In its turn susceptibility to these diseases is enhanced by the incapacity of the crop to react to applications of organic and synthetic fertilizers by reason of the high salt content of the soil in the superficial layers.

MASSEY (R. E.) & ANDREWS (F. W.). **The leaf curl disease of Cotton in the Sudan.**—*Empire Cotton Growing Review,* ix, 1, pp. 32–45, 6 pl., 2 graphs, 1 diag., 1932.

This is a brief account of the authors' field and experimental

investigation of the leaf curl disease of cotton in the Sudan, the results of which are in general agreement with those obtained by Kirkpatrick [*R.A.M.*, xi, p. 328 and preceding abstracts]. The trouble is stated to be most widely spread in the Gezira Sakel cotton area; it also occurs, however, in many other localities, and at Shambat, in particular, is present to a very variable degree on all the cultivated types of cotton, with the exception of the Asiatic ones. The great majority of plants show the first symptoms (which usually appear towards the end of September in cotton sown about the middle of August) on the second and third leaves below the main growing point, the infection then spreading with greatly varying intensity. The secondary growth from the node below the infected leaf usually exhibits symptoms of increased severity, and this is particularly true of the secondary growth induced by cutting back a diseased plant; the latter fact is believed to indicate that the infective principle is able to travel equally well down and up the stem. It was shown by numerous experiments that it is difficult to infect cotton plants that are not in active growth, a feature which is characteristic of virus diseases.

Histologically, the principal effect of infection during active growth is the stimulation of normal non-meristematic tissue to meristematic activity, leading to considerable hypertrophy of the cells of the leaves, bracts, and stems, and resulting in various malformations. In the stem irregular bundles develop, mainly confined to the ribbed portion of the cortex, although there are definite signs of a meristematic activity in the whole of the cortical layer; these bundles consist of central xylem elements surrounded by a cambium and phloem. New vascular bundles may also be formed in the medulla of infected petioles. In diseased leaves the normal palisade tissue is replaced by rectangular cells with large intercellular spaces which develop on both sides of the leaf, and similar cells also develop below the larger bundles, on the under surface of the leaf. No abnormal intracellular bodies were observed in the diseased tissues.

All attempts to transmit the disease by means of the expressed juice from infected plants gave negative results. The juice expressed from diseased leaves differs strikingly from that obtained from normal leaves in that it remains green while the latter immediately changes to a reddish-plum colour, owing to some chemical reaction which is apparently suppressed in the diseased leaves; all gradations of colour from red to green may, however, occur in the diseased juice, according to the severity of infection. The diseased leaves apparently contain much more chlorophyll than normal, and a chemical analysis of the expressed juices showed that the leaf curl sample contained a higher percentage of nitrogen, calculated on the dry weight basis.

No clear evidence was obtained that the disease can be transmitted by seed, though one suspicious case was observed. In a series of plot experiments to determine the effect of manuring on the incidence of leaf curl, no appreciable influence of the different manures was observable. The analysis of healthy and diseased leaves showed no differences in residual starch, pentosans, or

nitrogen but the determination of diastatic activity gave much higher figures for the diseased than the healthy leaves.

WARE (J. O.), YOUNG (V. H.), & JANSSEN (G.). **Cotton wilt studies. III. The behaviour of certain Cotton varieties grown on soil artificially infested with the Cotton wilt organism.**—*Arkansas Agric. Exper. Stat. Bull.* 269, 51 pp., 2 figs., 1932.

Continuing their investigations on cotton wilt (*Fusarium vasinfectum*) in Arkansas [*R.A.M.*, viii, p. 718; xi, p. 160], the writers found from seasonal counts [the results of which are tabulated] that, in general, the damage to susceptible varieties, e.g., Trice and Delfos, begins sufficiently early in the season to affect the yield considerably. In several cases a correlation was observed between susceptibility to wilt and earliness, but this was not a consistent feature, and on the other hand, lateness did not necessarily connote a high degree of resistance. Several of the 15 best cotton varieties may be recommended to Arkansas farmers for wilt-infested lands, e.g., Arkansas 17, D. & P.L. 6, or Lightning Express on bottom or delta lands for staple cotton; Super Seven, Miller, or Arkansas Rowden 40 on the same lands for staple of medium length; and Dixie Triumph and Dixie 14 for short staple either on bottom lands or wilt-infested upland. Among the 'tolerant' varietes, i.e., those giving satisfactory yields on wilt soil unless the infestation is intense, may be mentioned Cleveland 54, Arkansas Rowden 2088 and 2119, D. & P.L. 4, Express 121, and Wilson Type Big Boll.

Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August, 1931.—119 pp., 1932.

The following items of phytopathological interest occur in this report. The Bombay Agricultural Department is distributing from Dharwar the seed of a cross between two previous cotton selections—one a high yielder but susceptible to wilt [*Fusarium vasinfectum*: *R.A.M.*, x, p. 379] and the other less prolific but resistant. This cross is wilt-resistant and has the desirable characters of Dharwar (the susceptible parent). The prolific, wilt-resistant strain of *Gossypium verum* (No. 262) is in very great demand in the Central Provinces and Berar, where arrangements for the supply of the seed to growers have been organized on a large scale. During the year two new high yielding, wilt-resistant strains of 262 were isolated, viz., an early one to take the place of 'Jadi' in the northern and plateau districts, and a late strain suitable for the eastern portion of the cotton-growing tract.

In the sandy alluvial soils of Gujerat, root rot is the principal disease of cotton, and a scheme has been sanctioned for two years for an investigation of this problem.

WOODROOF (NAOMI C.). **Treating Cotton seed by the dusting method.**—*Georgia Exper. Stat. Bull.* 170, 16 pp., 1 fig., 1931.

This bulletin contains the experimental data on the continued experiments to determine the value of a number of chemical dusts in the control of cotton root rot (*Fusarium moniliforme*) [*Gibberella moniliformis*] in Georgia [see above, p. 430]. In the root rot

experiments, the average per cent. increase in germination from the highest yielding dust treatment for each year from 1926 to 1931 was 8·28 over the untreated control and 10·13 over the acid-delinted seed, the corresponding increases in yield being 140 and 187·1 lb. seed cotton, respectively.

All the dust treatments reduced the number of seedlings showing cotyledonary infection by *Bact. malvacearum* much below the figure for the untreated controls. In 1927 there were 11·6, in 1928 39·6, in 1929 7·8, and in 1931 47 times as many plants with angular leaf spot among the controls as in any single treatment. In 1927 5 out of 14, in 1928 3 out of 5, in 1929 2 out of 5, and in 1931 5 out of 7 treatments controlled angular leaf spot. In no case were lesions found on the cotyledons of seedlings from delinted seed soaked in mercuric chloride. Mercuric resinate gave perfect control in two out of three trials.

The benefits of seed treatment are greater in seasons when cold, wet weather follows planting, mainly on account of the protection afforded by the dust to the seed and seedlings. Ceresan is recommended for the treatment of cotton seed, this product being more readily accessible than the Du Bay preparations which seem, however, to be equally effective. The cost of ceresan is about 50 cents per lb., this quantity being sufficient to treat four bushels, using the dust at the rate of 4 oz. to 30 lb. of cotton seed. The acid-delinting process is considerably more expensive. A home-made duster is briefly described and directions are given for the application of the treatment.

FAHMY (T.). **The sore-shin disease and its control.**—*Min. of Agric., Egypt, Tech. & Sci. Service (Plant Protect. Sect.) Bull.* 108, 24 pp., 7 pl., 1931.

This is a progress report of the study since 1923 of the sore shin disease of cotton in Egypt and of its causal organism (*Rhizoctonia* sp.) [*R.A.M.*, x, p. 379], which was identified by Briton-Jones as *Corticium vagum* [*C. solani*: ibid., v, p. 19; regarded by Forsteneichner as a distinct species, *R. gossypii*: ibid., x, p. 788]. The disease is stated to be present wherever cotton is grown in Egypt, and to be especially severe on heavy, moist soils; all varieties of cotton are susceptible to it if sown early in the spring, when temperatures are unfavourable for the rapid development of the seedlings. Examination of young plants grown in artificially infected soil showed that the fungus attacks the seedling at the hypocotyl; after penetrating the cortical layers it forms a compact hyphal growth which kills the underlying cells; the latter are then progressively entered by the parasite until all the tissues at the hypocotyl are invaded and destroyed, the size and depth of the resulting cavity largely depending on the environmental conditions. When moisture and temperature are such as to retard the growth of the host, the fungus continues its progress until the seedling is girdled and killed; if, on the other hand, temperature rises during the invasion stage, the plant appears to be able to react by the production of suberin layers around the infected region even after the formation of a cavity, and such plants reach maturity, although large scars may be

present to show the point of attack at the seedling stage. In adult recovered plants there is a thick deposit of a resin-like substance on the walls of the cavity, which apparently cannot be penetrated by the hyphae of the fungus. It is pointed out that the rot which results from an attack of sore shin is not due solely to the *Rhizoctonia*, secondary organisms playing a considerable part in the rapid destruction of the invaded host tissues.

Of the many external conditions which have an influence on the incidence and severity of sore shin, field observations have shown that temperature and particularly rainfall in the spring are the most important, since rain, besides lowering the temperature of the soil, also hardens the surface and thus delays the emergence of the seedlings. Other important factors are the texture and tilth of the soil, and the depth and method of sowing. The best control of the disease was obtained by planting cotton seed previously soaked in water for 48 hours, in damp but not moist soil which had been brought to a fine tilth. Experiments with various seed treatments showed that they are economically valueless if the temperature continues below normal during the greater part of the early growth of the cotton plant.

WILLE (J.). **Die Bekämpfung der 'Chupadera'-Krankheit der Baumwolle in Perú durch Beizung mit Ceresan.** [The control of the 'chupadera' disease of Cotton in Peru by disinfection with ceresan.]—*Nachricht. über Schädlingsbekämpf.*, vii, 1, pp. 15–18, 2 figs., 1932.

Very good control of the 'chupadera' (sore shin) disease of cotton (*Rhizoctonia*) [*Corticium solani*] was obtained over an area of 6 hect. near Callao, Peru, by dusting the seed with ceresan at the rate of 600 gm. per 70 kg. of seed [cf. *R.A.M.*, x, p. 103]. The incidence of infection was reduced from 80 to 30 per cent. This disease is stated to cause heavy infection not only of the very young seedlings but also of more fully established ones, on which it causes a kind of root scorch. It is most severe when the seed is sown relatively early in the season. In the author's experiment, which was carried out under strictly controlled conditions, the untreated drills required extensive replacement of the killed plants, whereas in the treated rows the gaps were too few to have an appreciable effect on the final stand.

PETCH (T.). **Some Philippine entomogenous fungi.**—*Ann. Mycol.*, xxx, 1–2, pp. 118–121, 1932.

A list is given of eleven entomogenous fungi from the Philippine Islands, most of which are parasitic on Aleyrodidae. *Hypocrella philippinensis* on a Aleyrodid on undetermined leaves and *Aschersonia philippinensis* (its conidial stage) are described as new, with Latin diagnoses.

BOCZKOWSKA (MARJA). **Zmiany w organizmie gąsienicy bielinka kapustnika (Pieris brassicae L.) wskutek porażenia owadomorkiem korzonkowym (Entomophthora sphaerosperma Fres.).** [Changes in the body of the larvae of the Cabbage butterfly (*Pieris brassicae* L.) caused by infection with an entomogenous

fungus (*Entomophthora sphaerosperma* Fres.).]—Reprinted from *Roczniki Nauk Rolniczych i Leśnych* [*Yearbooks of Agric. and Silvicult. Sciences*], Poznań, xxvii, 20 pp., 1 pl., 8 figs., 1932. [English summary.]

The author states that her examination of the larvae of the cabbage butterfly (*Pieris brassicae*) exhibiting various stages of the disease caused in them by *Entomophthora sphaerosperma* [*R.A.M.*, viii, p. 502] showed that in the initial stage, characterized by a gradual disappearance of green colour from the body of the larva, mycelial elements of the fungus are carried in the blood stream. Hyphal bodies [ibid., viii, p. 719] are not formed. The organism chiefly attacks and destroys the oenocytes, while the adipose tissue is attacked to a certain degree at the beginning of the infection, but is never a centre of vigorous development of the fungus. The internal cavities, the muscles, Malpighian tubes, and the epidermal tissue are only invaded after death. Phagocytosis of the mycelium in the body of the larva was not observed. Cultural experiments indicated that the best media for growth of the fungus are the blood and the oenocytes, and that the organism does not develop on the plant remains inside the intestine; it also refused to grow on artificial media containing peptone, carbohydrates, and mineral salts. Azygospores are formed in the host tissues from the first stages of infection.

Wallengren (H.). **Metarrhizium anisopliae såsom medel i kampen mot Pyrausta nubilalis Hb.** [*Metarrhizium anisopliae* as a means for the control of *Pyrausta nubilalis* Hb.]—*Lunds Univ. Årsskr.*, N.F., Avd. 2, xxvii, 12, 15 pp., 1 fig., 1 diag., 1931. [German summary.]

Continuing his laboratory and greenhouse experiments at Lund, Sweden, on the control of the European corn borer (*Pyrausta nubilalis*) by *Metarrhizium anisopliae* [*R.A.M.*, ix, p. 716], the writer found that the newly emerging larvae of the insect are highly susceptible to infection by the conidia of the fungus, the mortality in three tests being 70·15, 54·5, and 45 per cent. during the first 20 days of life. In the later stages (34 to 65 days old) only 6·66 per cent. of the larvae were killed in 15 days. The conidia of *M. anisopliae* are unable to infect the eggs of the corn borer.

Numerous experiments were conducted to determine whether maize plants could be protected from infestation by *P. nubilalis* by dusting them with the conidia of *M. anisopliae*, either in the pure state or mixed with potato flour (10 : 2 or 10 : 1). Excellent results were obtained by both methods, the incidence of mortality of the larvae being 99·13 per cent. in the former and 99 in the latter. Field experiments by Dr. B. Hergula at Zagreb, Jugo-Slavia, with conidia of *M. anisopliae* supplied by the writer, confirmed the Swedish laboratory results and indicated the feasibility of practical control by this method.

Talice (R. V.). **Parasitisme des hérissons par les Mycotorulées.** [Infection of hedgehogs by species of Mycotorulaceae.]—*Ann. de Parasitol. Humaine et Comp.*, x, 1, pp. 81–84, 1932.

In this note the author states that the post-mortem examination

of six out of eight apparently healthy hedgehogs which were killed by him, revealed the presence on the mucous membranes and in some of the glandular cavities of their digestive tract, and also in their faeces, of two fungi which subsequent cultural studies showed to be referable to the Mycotorulaceae [see below, p. 476]. One of these organisms was identified as *Mycotorula albicans* (Ch. Robin 1853), and the other as a species of *Mycotoruloides*. It is pointed out that no visible lesions were caused by either of these organisms in the digestive tract of the hedgehogs.

STEYN (D. G.). **Investigations into the cause and transmission of lumpy wool affecting merino sheep and its treatment.**—*Seventeenth Rept. Dir. Vet. Serv. & Animal Indus., Union of South Africa,* Part i, pp. 205–213, 6 figs., 1931. [Abs. in *Veterinary Bull.*, ii, 2, p. 75, 1932.]

Investigations by the author showed that 'lumpy wool' of sheep in South Africa, first reported to the authorities in 1925, is essentially the same as the condition caused in Australia by *Actinomyces dermatonomus* [*R.A.M.*, x, p. 455]. In South Africa, lumpy wool prevails chiefly in wet, misty districts, such as Natal and the Eastern Cape Province, and is commonest in warm, moist weather. Mortality is low and transmission slow, but when climatic conditions favour the fungus the diseased sheep, unless treated, die.

Transitory lesions closely resembling those characteristic of the disease were produced by rubbing wool scrapings showing the fungus into moistened skin, intact or scarified; similar results followed when pure cultures of the fungus were poured on to scarified skin.

The early stages of the disease readily respond to applications of a mixture of raw linseed oil and 3·5 per cent. tincture of iodine in equal parts, but sheep showing an advanced stage of the disease should be slaughtered and those affected should be isolated.

BERGMANN (M.). **Skin diseases as the cause of leather defects.** —*Collegium, 1931,* pp. 823–830, 1931. (German.) [Abs. in *Journ. Soc. Chem. Ind.*, li, 18, p. 360, 1932].

Certain defects in leather, e.g., 'Salzstippen' ['salt spots'] and damage of the papillary layer, have been traced to the action of fungi on the raw skin. *Trichophyton* spores have been found in damaged parts of the grain of finished leather, in the tissues of leathers tanned from diseased Bavarian hides, and in the hair canals in finished leathers. The proteinases in the fungi can attack skin collagen, forming therewith a compound possessing different colloid-chemical properties from those of the collagen itself.

SARTORY (A.), SARTORY (R.), STERNON (F.), & MEYER (J.). **Une dermatomycose causée par une levure nouvelle du genre Saccharomyces: 'Saccharomyces sternoni' n. sp.** [A dermatomycosis caused by a new yeast of the genus *Saccharomyces*: *Saccharomyces sternoni* n. sp.]—*Bull. Acad. Méd.*, cvii, 4, pp. 120–121, 1932.

From the squamae covering a deep-seated, inflamed lesion in the interdigital region of the right foot of a joiner, the writers isolated a yeast characterized by spherical cells, 2 to 2·5 μ in diameter, and

by globular, spherical, or slightly oval asci, 3·75 to 4 μ in diameter, always containing four round ascospores, 1·25 to 1·5 μ in diameter. The optimum temperature for the growth of the fungus was found to be between 23° and 25° C. Inoculation experiments on guinea-pigs resulted in the development of erythemato-squamous lesions closely resembling those on the above-mentioned patient. The name *Saccharomyces sternoni* n. sp. is proposed for the parasite.

Davidson (A. M.), Dowding (Eleanor S.), & Buller (A. H. R.). **Hyphal fusions in dermatophytes.**—*Canadian Journ. of Res.*, vi, 1, pp. 1–20, 3 pl., 22 figs., 1932.

A detailed account is given of cultural experiments with three dermatophytes, namely, *Microsporon audouini*, *M. lanosum*, and *Trichophyton gypseum*, isolated from clinical cases, the results of which showed that fusions were formed between hyphae of the same species whether isolated from one or different patients, but were not produced between the hyphae of one species and those of any other species paired with it in culture. This was true for the three species enumerated above, and also when *T. gypseum* was paired with the very similar *T. granulosum* or with *Epidermophyton interdigitale* which is botanically indistinguishable from *T. gypseum*.

These results lead the authors to consider that the presence or absence of hyphal fusions may be of diagnostic value for the identification of species of dermatophytes, by pairing them with known stock cultures. The absence of fusion is considered to be evidence that the species mentioned above are distinct.

Pezzi (G.). **Contributo allo studio del 'piede di Hong-Kong'.** [Contribution to the study of 'Hong-Kong foot'.]—*Ann. Med. Nav. e Colon.*, xxxvii (ii), 5–6, pp. 713–722, 2 pl., 1931. [Abs. in *Trop. Dis. Bull.*, xxix, 4, p. 272, 1932.]

Twenty-five cases of 'Hong-Kong foot', a condition of interdigital eczema very prevalent in tropical countries and causing intense irritation, were treated by the writer at the Catholic Mission Hospital, Hankow, China. From seven of the patients he isolated *Epidermophyton* [*Trichophyton*] *rubrum* and from the remainder *E. inguinale* [*E. floccosum*: *R.A.M.*, xi, p. 44], the latter being isolated also from the lesions in other parts of the body in four cases.

Agostini (Angela). **Miceti della Cirenaica.** [Fungi of Cyrenaica.]—Reprinted from *Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iii, 10 pp., 3 figs., 1931. [Latin summary.]

In this paper the author gives brief notes on 14 species of fungi sent for examination from the province of Derna in Cyrenaica, all of which are stated to be new records for that province. Eleven of these organisms were isolated from lesions on man or animals, and two of these, namely, *Aspergillus oryzae* from an eczema of the auricular canal in man, and *Acrostalagmus cinnabarinus* from an abscess of the mammary gland in a mare, are reported as human and animal pathogens, respectively, for the first time, as far as the author is aware.

Kochman (J.). **Choroby Róż.** [Rose diseases.]—Reprinted from *Choroby Roślin* [*Plant Diseases*], Warsaw, i, 3–4, 25 pp., 2 pl., 12 figs., 1931. [English summary.]

This is a semi-popular account (including some notes of local interest) of the chief parasitic diseases of the rose in Poland, namely, mildew (*Sphaerotheca pannosa*), black leaf spot (*Marssonina rosae*), rust (*Phragmidium subcorticium*) [*P. mucronatum*], downy mildew (*Peronospora sparsa*), brown leaf spot (*Septoria rosae-arvensis* and *S. rosarum*), grey rot of the flowers (*Botrytis cinerea*), stem canker (*Coniothyrium wernsdorffiae*), and crown gall (*Bacterium tumefaciens*). Recommendations for the control of these diseases are also given.

Blattný (C.) & Vukolov (V.). **Novotvary na kořenech Růže (Rosa).** [Neoplasms on the roots of the Rose (*Rosa*).]—*Ochrana Rostlin*, xi, 6, pp. 169–175, 3 figs., 1931.

In this preliminary note a brief account is given of coralloid, lobate outgrowths which were observed in the autumn of 1931 on the roots of several varieties of roses grown in a commercial nursery near Prague, and which were macroscopically very reminiscent of the similar formations on the roots of the alder, *Eleagnus*, and *Hippophaë*, attributed by some to the activity of endotrophic species of *Actinomyces* [cf. *R.A.M.*, vii, p. 592; x, p. 476]. Examination of the rose outgrowths revealed the presence in them of fungal elements, the characters of which point to their belonging to an Actinomycete, the closer study of which is reserved for the future. Considerable variations were found in the size and frequency of these neoformations on the different varieties of roses, ranging from almost complete immunity in the dog rose (*Rosa canina*) to high susceptibility in the varieties Louise Sauvage and Mosel, in which the galls were very numerous and attained a diameter of 2·6 cm. in the former and up to 4 cm. in the latter.

As far as the authors are aware this is the first report of such galls on the rose. On the plots on which the roses were attacked, young trees of the alder, *Eleagnus*, and *Hippophaë* had been raised two years previously, without, however, developing outgrowths on their roots. The same varieties of roses grown in neighbouring plots remained immune. The rose neoformations appeared to check to some extent the initial normal growth of the young plants, more particularly of the varieties apparently exhibiting resistance, but the presence of numerous and large outgrowths did not seem to affect adversely the later health of the more susceptible ones. Most of the neoformations appeared to develop at or from the points where the roots of the young plants had been pruned before planting.

Schmidt (A.). **Kräuselkrankheit bei Pelargonien.** [Curl disease of *Pelargonium*.]—*Gartenflora*, lxxxi, 2, p. 40, 1932.

The cause of the leaf curl disease of *Pelargonium*, which was responsible for severe damage in Germany in 1931, is stated to be still obscure [*R.A.M.*, x, p. 461]. Many horticulturists attribute it to fungous infection, but in the writer's opinion the symptoms point rather to invasion by the leaf bug (*Lygus*). Good control has been

obtained by spraying with quassia and soft soap, veneta, or parasitol at 1 per cent. and with vomasol at 0·5 per cent. [ibid., x, pp. 705, 735].

MASSEY (L. M.) & TILFORD (P. E.). **Cyclamen stunt.**—Abs. in *Phytopath.*, xxii, 1, p. 19, 1932.

Cyclamen stunt was observed in New York in 1926 and in Ohio in 1929, and is also known to occur in Pennsylvania, New Jersey, and California. Affected plants are conspicuously stunted, with small, sometimes yellow leaves, abnormally short petioles and peduncles, and flowers characteristically open below the leaves. Reddish-brown necrotic areas occur in the corm tissues, mostly in the crown but at times extending as far as the petioles, peduncles, and larger roots. The causal organism of the disease, as established by successful inoculations, is a hitherto undescribed *Cladosporium*, for which the name *C. cyclaminis* n. sp. is proposed. Growth in culture is slow, and results on potato-dextrose agar in a stroma-like black thallus, commonly covered with a greyish-white aerial mycelium. The hyaline to brown, non- to uniseptate spores, measuring 17·75 by 4·3 μ, are found in culture in 4 to 7 days, acrogenously, singly or in short chains, on short, rarely branched conidiophores.

WEBER (ANNA). **Løgsygdomme.** [Bulb diseases.]—Reprinted from *Aarbog for Gartneri, 1931*, 19 pp., 7 figs., 1932.

Notes (stated to be largely based on information obtained from Prof. E. van Slogteren in Holland) are given on the symptoms, etiology, and control of some fungous, bacterial, and non-parasitic diseases of flowering bulbs in Denmark, including tulip 'fire' (*Botrytis tulipae*) [*R.A.M.*, xi, p. 108]; sclerotial disease of tulips (*Sclerotium tuliparum*) [ibid., xi, p. 376]; white disease of tulips, hyacinths, and narcissi (*Penicillium corymbiferum* and probably other species of *Penicillium*) [ibid., viii, p. 42]; 'falling' disease of tulips [ibid., ix, p. 528]; yellow rot of hyacinths (*Phytomonas* [*Pseudomonas*] *hyacinthi*) [ibid., x, p. 598]; *Fusarium* disease of narcissus (*F. orthoceras* according to Feekes [ibid., x, p. 794] but attributed by van den Broek and Schenk in Ziekten en beschadigingen der tuinbouwgewassen, 1925, to *F. elegans*); narcissus 'smoulder' (*B. narcissicola*) [ibid., ix, p. 40; or *S. perniciosum*: ibid., xi, p. 376]; root decline of narcissi and hyacinths caused by *Cylindrocarpon radicicola* and *F. culmorum*, respectively [ibid., x, p. 795]; and *Botrytis* disease of snowdrop (*B. galanthina*) [ibid., x, p. 294].

FERGUS (E. N.). **An analysis of Clover failure in Kentucky.**—*Kentucky Agric. Exper. Stat. Bull.* 324, pp. 443–476, 2 graphs, 1 map, 1931.

This is a report of the continued study of the causes of the failure of red clover (*Trifolium pratense*) in Kentucky [*R.A.M.*, vi, p. 558], each of the contributing factors being briefly discussed separately. Low fertility of the soil, although responsible for a fair proportion of partial failures of the crop, causes relatively few complete failures, since poor soils are usually avoided. Winter

injury to the plants is considered to be probably the most common cause of the trouble. Southern anthracnose (*Colletotrichum trifolii*) [ibid., viii, p. 176] is frequently an important contributory and occasionally the only cause of complete failure, particularly of north-western Kentucky home-bred clovers; it is also severe on northern domestic and on European and Chilean varieties. Northern anthracnose (*Gloeosporium caulivorum*) [*Kabatiella caulivora*: loc. cit.] does most damage to southern Kentucky clovers. The black stem disease [ibid., viii, p. 726] is severe on European and attacks northern Kentucky varieties to some extent. Crown rot (*Sclerotinia trifoliorum*) [ibid., xi, p. 246] is much more injurious to some clovers than to others, but so far no correlation has been established between susceptibility and the place of origin of the host plant. The severity of root rot (the cause of which is not yet known) appears to be related more closely to the fertility of the soil than to the nature of the clover varieties.

Riker (A. J.) & Banfield (W. M.). **Studies on the development of crown gall, hairy root, and wound overgrowths in treated soil.**—*Phytopath.*, xxii, 2, pp. 167–177, 1 fig., 1932.

Typical crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) and hairy root (*P.* [*Bact.*] *rhizogenes*), have been induced at will in both steamed and natural sandy loam soil on nursery apple trees of the Wealthy variety in Wisconsin [*R.A.M.*, x, p. 165]. Inoculations with mixtures of the two organisms resulted in enlargements showing the features of both crown gall and hairy root, with a considerable range of mixed characters. Generally speaking, callus tissue on Wealthy apples does not appear to be an open infection court for either of these organisms.

Riker (A. J.), Hildebrand (E. M.), & Ivanoff (S. S.). **The development of crown gall, hairy root, and wound overgrowth in glass cylinders.**—*Phytopath.*, xxii, 2, pp. 179–189, 2 figs., 1932.

A detailed account is given of the writers' studies on the development of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*), hairy root (*P.* [*Bact.*] *rhizogenes*), and wound overgrowths on Wealthy and Yellow Transparent nursery apple trees kept under glass cylinders [see preceding abstract]. The results of the experiments indicated that the two bacterial diseases possess distinctive features that may be induced by inoculation with the appropriate organisms under rigidly controlled conditions, whereby the possibility of a mixture of causal agents is virtually excluded. The best responses were secured by treatments made before 1st July, and incubation periods of at least two months were found to be desirable.

Palmiter (D. H.). **Variability of Venturia inaequalis in cultural characters and host relations.**—Abs. in *Phytopath.*, xxii, 1, p. 21, 1932.

Monoconidial cultures of *Venturia inaequalis*, isolated from 14 apple varieties from four States showed cultural differences not correlated with the locality or variety from which they were

isolated. Various species of *Malus* [*Pyrus*] were infected by one or more of these cultures in greenhouse tests, but inoculations on *P. floribunda* and some others failed. The Yellow Transparent apple variety was infected by 5 strains and resistant to 4; McIntosh, infected by 2 and resistant to 3; Dudley and Missouri Pippin, infected by 3 and resistant to 2; Hubbardston Nonsuch, infected only slightly by 3 and resistant to 2 of the cultures. The other 15 varieties inoculated proved susceptible to all the cultures.

CURZI (M.). **Malattie del Pesco caratterizzate da filliscosi ('Phony disease' e 'malattia pennacchio').** [Peach diseases characterized by abnormal foliage development ('Phony disease' and 'plume disease').]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 3, pp. 221–243, 2 pl., 7 fig., 1931.

Early Elberta peach trees in numerous localities in Italy, especially Tuscany and central Italy, have in recent years developed a condition, restricted exclusively to this one variety (even other Elbertas remaining unaffected), which somewhat resembles phony disease [*R.A.M.*, ix, p. 727; x, p. 643] and is known locally, from the characteristic appearance of severely affected branches, as 'plume' disease.

The disease differs from phony disease [the symptoms of which are fully described], in spite of a superficial resemblance in the shortened branches with a typical 'court noué' appearance [cf. ibid., x, p. 433] and an abnormally vigorous leaf development, in several particulars. Thus, the condition is most severe on young trees, noticeably less so on older ones, and is not present at all or very slightly on some of the terminal branches. Also, the symptoms are limited to areas in which lesions are found in the axillae of the leaves. On the same tree and the same branch there may be normal and abnormal leaves and twigs. The last shoots developed at the end of September or in October do not show the court noué appearance and frequently bear no lesions in the axillae; the leaves droop slightly along the midrib like those of healthy trees but are never rigid, with an almost straight midrib and the blade rolled up so as to form a kind of gutter or pipe like those on the shortened part of the branch.

The stalk of the diseased leaves is thickened, owing to a hypertrophy of the cortical parenchyma cells. Beneath the insertion of the leaf the cortical cylinder of the branch is more developed than the part a very little above, and apparently this difference in the growth of the branch produces the dark lesion present in the axilla which is in the form of an isosceles triangle with the base towards the bud and the apex upward. In this triangular area the cortex of the affected branches is thinner than normal and the overlying epidermis is lacerated. In severe cases the buds may be partially or completely destroyed.

The author found no trace of any fungal parasite in these lesions. From the characters of the condition, which bears a certain resemblance to that caused in America by the mite *Tarsonemus waitei* Banks, he thinks that it is very probably due to infestation by red spider (*Tetranychus telarius*), an acarus

resembling which was found on the lesions of some of the affected trees.

VOGEL (F.) & WEBER (E.). **Zur Blattrandkrankheit der Johannisbeere.** [On leaf scorch of the Currant.]—*Gartenbauwissensch.*, v, p. 457, 1931. [Abs. in *Fortschr. der Landw.*, vii, 8, p. 234, 1932.]

Observations and experiments at Weihenstephan, Bavaria, showed that healthy currants have a higher average weight and a higher sugar and acid content than those from leaf scorch bushes [*R.A.M.*, xi, p. 312], whereas the chlorine content of diseased fruit is about five times higher than that of the sound. This fact points to injury by chlorine, a theory supported by the increased water absorption and salt accumulation in the wood of diseased bushes. Potash deficiency, however, is also indicated by the reduced salt content of the leaf ash and of the subsoil below the affected bushes.

PLAKIDAS (A. G.). **Infection studies with Mycosphaerella fragariae and Diplocarpon earliana.**—Abs. in *Phytopath.*, xxii, 1, p. 21, 1932.

The infection of strawberry leaves by *Mycosphaerella fragariae* and *Diplocarpon earliana* [*R.A.M.*, x, p. 254] has been found to take place primarily through the lower leaf surface. *M. fragariae* enters through the stomata, and there is an apparent correlation between the amount of infection and the number of stomata, which in the Klondike variety averaged 3·16 and 14·77 per sq. mm. on the upper and lower surfaces, respectively. *D. earliana* does not seem to enter through the stomata, but its exact mode of penetration has not been determined.

KERVEGANT (D.). **Le Bananier à la Martinique.** [The Banana in Martinique.]—*Agron. Colon.*, xxi, 169, pp. 6–12, 1 pl., 1932.

The causal organism, *Fusarium cubense* [*F. oxysporum*: *R.A.M.*, x, p. 626], of Panama disease is reported to have been observed by Mr. D. Gent on Makanguia bananas in various parts of Martinique; as this variety is not extensively cultivated, the disease does relatively little damage, but the presence of the fungus renders it impossible to lay down any large plantation of Makanguias.

In one young banana plantation made without previous soil disinfection on old cacao land the author noted a serious case of foot rot due, apparently, to *Lasiodiplodia* [*Botryodiplodia*] *theobromae*.

The following caused rots of gathered banana fruits and fruit stalks: *Thielaviopsis* [*Ceratostomella*] *paradoxa*, *B. theobromae*, and *Gloeosporium musarum*.

DAMPF (A.). **Mexico: Panama disease of Bananas.**—*Internat. Bull. of Plant Protect.*, vi, 2, p. 24, 1932.

Fusarium cubense var. *inodoratum* [*F. oxysporum*], the causal organism of Panama disease [see preceding abstract], is reported on banana plants collected in the State of Tamaulipas, Mexico.

WARDLAW (C. W.). **Banana diseases. IV. Notes on 'black-tip' disease in Trinidad; Helminthosporium torulosum (Syd.) comb. nov. Ashby.**—*Trop. Agriculture*, ix, 1, pp. 3–6, 4 pl. (facing pp. 4 & 5, and 28 & 29), 1932.

Continuing his studies of banana diseases [*R.A.M.*, xi, p. 382], in this paper the author deals with the 'black-tip' disease of the fruit caused by *Helminthosporium torulosum* [ibid., x, p. 806]. The fungus (the synonyms of which are *Cercospora musarum* and *Brachysporium torulosum* Sydow) has been observed attacking the fruits of the Canary and Cavendish (Governor) varieties of *Musa cavendishii*, and on Lacatan and Gros Michel bananas; it also causes leaf spots on the Cavendish banana. In culture on a standard medium containing 2·5 per cent. sucrose plus mineral salts it forms normal conidia measuring 30 to 100 by 12 to 16 μ, while on a medium containing 0·5 per cent. sucrose the largest measured 160 by 20 μ, intermediate ones 85 by 18 μ, and the smaller 50 to 60 by 14 μ. The conidia originate by a budding process at the tip of the conidiophore, transverse septa being formed successively as the spore increases in length, until as many as 11 or 12 may be present. Ashby's original description of the conidia as smoky-olive in colour, pear-shaped, widest above the base and narrowing thence to a blunt point is most characteristic of the shorter, stumpy form. The conidiophores, according to age, may be simple or considerably developed. The type of growth in pure culture and the measurements obtained for the conidia were shown to be considerably influenced by the composition of the nutrient medium, especially by the source of carbon and nitrogen. High asparagin concentrations, in particular, restricted sporulation and caused the appearance of a number of abnormal features in the conidiophores and conidia.

MARTIN (H.). **The chemistry of insecticides and fungicides.**—*Journ. South-Eastern Agric. Coll., Wye*, Kent, xxix, pp. 31–34, 1932.

Further experiments conducted at Wye, Kent [*R.A.M.*, xi, p. 253], showed that all the glyceride oils tested were fungicidal towards hop powdery mildew [*Sphaerotheca humuli*], this property being inherent in the glyceride, not due to adventitious material, and apparently greatly influenced by the manner of emulsification. Field trials of the action of these oils upon apple and gooseberry varieties intolerant of sulphur [cf. ibid., xi, p. 381] gave promising results with certain naphthols, evidence also being obtained that the action of these compounds upon *S. humuli* and the hop leaf is intimately related to their chemical structure.

In response to inquiries from hop growers as to the possibility of combining nicotine with Bordeaux mixture to simplify the control of downy mildew [*Pseudoperonospora humuli*: see below, p. 471] and insect infestation, experiments were conducted to obtain a satisfactory combination of contact insecticides with copper fungicides. As the spreading properties of soap are destroyed on its addition to Bordeaux mixture by the excess lime present, and as it would appear that casein and gelatine when used with Bordeaux mixture seriously interfere with the formation of soluble copper after

spraying, the nature of the spreader offered difficulty; this was, however, solved by the discovery that sulphite lye may safely be used. This may be bought in concentrated form as a viscous liquid or as a powder so cheaply that its cost per 100 galls. of spray is less than sixpence. Field trials were conducted to ascertain whether in the presence of sulphite lye the use of a coarser spray than usual (this appears to be necessary for insect control) would give a sufficiently lasting Bordeaux deposit; good results were obtained, but further trials are necessary before a definite recommendation can be made to growers.

An alternative method of incorporating a contact insecticide with the protective fungicide is by means of an oil solution of the former emulsified with Bordeaux mixture. This was found to be satisfactory, and field trials upon potatoes showed that the adhesiveness of the Bordeaux deposit was greatly increased by the presence of the oil. Further investigations are in progress along these lines.

LIMING (O. N.). **The relation of pentathionic acid and its component constituents to the toxicity of sulphur fungicides.**—*Phytopath.*, xxii, 2, pp. 143–165, 5 figs., 1932.

Continuing his studies on the relation of pentathionic acid to the toxicity of sulphur fungicides [*R.A.M.*, ix, p. 734], the writer conducted experiments [with a special apparatus which is described] on the physical and chemical nature of volatilized sulphur. The rate of vaporization of the volatile product of sulphur was found to be affected by temperature, a rise from 23° to 93° C. causing an increase of about 20,000 times. The use of glass-wool filters showed that the sulphur was given off in a gaseous state. Sulphur vapour itself was found not to be toxic to the spores of *Sclerotinia cinerea* and *Cladosporium fulvum*, but after standing for 24 hours the condensation products (recrystallized sulphur) became toxic and reduced the germination percentages in *S. cinerea* from 89·4 to 27·4 per cent., from 91 to 12·2 per cent., and from 75·7 to 0·9 per cent. with sulphur vaporized at 80°, 110°, and 200°, respectively.

Sulphur dioxide occurs only in traces in ground sulphur and in such concentrations is not toxic to the spores of *S. cinerea*. The formation of this gas appears to be favoured by light and high temperatures; as a transitory factor in the production of pentathionic acid, it probably plays an important part in the toxicity of sulphur fungicides. Ground sulphur contains no hydrogen sulphide. Traces of this gas are produced from sulphur by various higher plants [which are enumerated], as well as by a number of fungi, including *S. cinerea*, *S. sclerotiorum*, *Rhizoctonia* [*Corticium*] *solani*, *Venturia inaequalis*, *Botrytis cinerea*, and several others, but it is not toxic to fungi at such concentrations.

On the other hand, pentathionic acid, a natural oxidation product of sulphur, of which about 0·0002 millimol occurs in 1 gm. of National 300-mesh sulphur, was found to be toxic at a strength of 0·0068 N. in a buffer-mannite solution to the spores of *S. cinerea*, *B. cinerea*, and several other fungi. This substance, however, is not sufficiently volatile in dilute solutions (0·05 N.) to be toxic at a distance, e.g., to spore suspensions held 4 mm. above the acid.

The toxicity of sulphur filtrates (0·006 N. from ground sulphur and 0·008 N. from flowers of sulphur) previously reported [loc. cit.] to the spores of *S. cinerea* is attributed to a combination of the vaporization of sulphur and the oxidation of the condensed vapour. Hydrogen sulphide is believed to be a contributory factor in these reactions [cf. ibid., x, p. 395]. The pentathionate ion was found to be stable in weak acid and alkaline solutions, but it is toxic to *S. cinerea* only in the former. The toxic action appears to be governed by the condition of the fungus tissue, probably the amphoteric substances, rather than by that of the pentathionate ion.

SABALITSCHKA (T.). **Schutz der Lebensmittel gegen Mikrobenbefall durch unschädliche Konservierungsmittel.** [Protection of foodstuffs against microbial infection by innocuous preservatives.]—*Mitt. Gesellsch. für Vorratsschutz*, viii, 1, pp. 6–10, 1932.

The ethyl ester of the p- oxybenzoic acid is on the market under the name of nipagin A, the propyl ester being known as nipasol, while a combination of both, nipakombin (J. Penner A.-G., Chemische Abteilung, Berlin-Schöneberg), has been found superior to either alone in the protection of foodstuffs against decay due to fungi, bacteria, and yeasts. Used at a strength of 0·075 per cent., nipakombin preserves unsweetened cherries, apple, plum, and apricot jam, strawberry, gooseberry, raspberry, and currant pulp, and the like; at 0·06 per cent. it is effective in the preservation of raw cherry and raspberry juice, malt extract solution, and cider, and at 0·04 per cent. in that of unsweetened fruits, jams, and juices. Among other foodstuffs for which nipakombin may be used are preserved fish, pastries, sweets, lemonade, &c., while it is claimed further to exercise a preservative action on tobacco, and may also find application in the technical, pharmaceutical, and cosmetic industries.

CRUESS (W. V.) & IRISH (J. H.). **Further observations on the relation of P_H value to toxicity of preservatives to microörganisms.**—*Journ. of Bact.*, xxiii, 2, pp. 163–166, 1932.

In a previous paper (*Journ. of Bact.*, xvii, p. 363, 1929) it was shown that much more sodium benzoate was required to prevent the growths of yeasts, moulds, and bacteria at P_H values near neutrality (P_H 5 to 8) than in the acid range of P_H 2·5 to 4·5. The present studies were conducted to determine the approximate concentrations of benzoic, salicylic, sulphurous, and acetic acids necessary to prevent the growth of *Penicillium glaucum*, *Saccharomyces ellipsoideus*, and bacteria obtained from fruit juice. It was found that, on an apple juice medium, more than 150 times as much sodium salicylate was required to prevent growth at P_H 7 as at P_H 2·5. At P_H 7 none of the concentrations of sodium salicylate used appreciably affected the fermentation rate, which was retarded by small concentrations of the chemical at P_H 2·5 and 3·5. Similar data were obtained in respect of the other acids tested, whereas the preservative action of formaldehyde and sodium chloride were little affected by the P_H value of the medium.

Department of Scientific and Industrial Research. Water pollution research. Summary of current literature, v, 1, pp. 1–36, London, H.M. Stationery Office, 1932.

The present number of the summary of current literature on water pollution research contains 123 abstracts on the treatment of water supplies, analysis and examination of water, sewage, trade waste waters, pollution of natural waters, and miscellaneous aspects of water contamination.

ROGERS (L. A.). **The American Type Culture Collection.**—*Journ. of Bact.*, xxiii, 2, pp. 193–194, 1932.

The grant made by the Rockefeller Foundation to the American Type Culture Collection having now expired and no fresh sources of income being available under the present conditions, it has been found necessary to increase the price of cultures from $1 to $2. During the seven years since its establishment at the John McCormick Institute for Infectious Diseases, the activity of the Collection has steadily increased, the number of cultures sent out in 1931 being 5,019 (including 350 fungi for research and industrial purposes) as compared with 1,540 in 1925.

LINK (G. K. K.) & RAMSEY (G. B.). **Market diseases of fruits and vegetables. Potatoes.**—*U.S. Dept. of Agric. Misc. Publ.* 98, 62 pp., 15 pl. (13 col.), 1932.

This bulletin is stated to be the first of a series 'designed to aid in the recognition and identification of pathological conditions of economic importance affecting fruits and vegetables in the channels of marketing, with a view to facilitating the market inspection of those food products and reducing and preventing losses from such conditions'. Popular notes are given on the symptoms, etiology, and control of a number of well-known fungous, bacterial, and physiological diseases affecting potato tubers in the United States. The symptoms of many of these are illustrated in colours.

A bibliography of 196 titles is appended.

MÜLLER (D.). **Die Assimilation der blattrollkranken Kartoffelpflanzen.** [The assimilation of leaf roll-diseased Potatoes.]—*Planta*, xvi, 1, pp. 10–15, 1 graph, 1932.

A comparative study was made at the Laboratory of Plant Physiology, Copenhagen University, Denmark, of the stomatal dimensions, respiratory intensity, and carbon dioxide assimilation of healthy and leaf roll Magnum Bonum potato plants [*R.A.M.*, xi, p. 319].

The width of the stomatal apertures was found to be less in diseased than in healthy plants. Respiratory intensity per unit area was approximately equal in both series. Carbon dioxide assimilation was found to be much reduced in diseased as compared with healthy leaves, the maximum intensity of this process in the former amounting to only 2 to 2·5 mg. CO_2 per 50 sq. cm. (unilateral) per hour at 20° C. and normal pressure, against 7 mg. in the latter. The figure for diseased but not rolled leaves was

intermediate (5 mg.). No improvement in the assimilatory capacity of rolled leaves was induced by darkening the plants in order to eliminate the starch. Possibly the low yield of dry substance from leaf roll potatoes is partially or entirely explicable on the basis of reduced assimilatory intensity.

NEUWEILER (E.). **Switzerland: Potato wart disease.**—*Internat. Bull. of Plant Protect.*, vi, 1, pp. 5–6, 1932.

Sporadic outbreaks of potato wart (*Synchytrium endobioticum*) have occurred in Switzerland since the first discovery of the disease in that country in 1925 [*R.A.M.*, v, p. 627]. All the 13 centres of infection detected between 1926 and 1930 were destroyed by boiling the diseased crops, disinfecting storage premises and implements, and putting the infected fields down to grass for ten years. In 1931 the fungus was reintroduced into eight cantons on large consignments of the reputedly immune Alma variety from East Prussia, and three further centres of infection have been found in two other cantons in Alma, Frühe Rosen, and Kaiserkrone potatoes. Drastic measures, including the use of resistant varieties, will be adopted to check the spread of the disease [cf. ibid., x, p. 816].

NEWTON (W.). **The physiology of Rhizoctonia.**—*Scient. Agric.*, xii, 3, pp. 178–182, 3 graphs, 1931.

Growth temperature studies [by a method which is indicated] showed that the lethal temperature period for cultures of *Rhizoctonia* [*Corticium*] *solani* obtained from infected potato tubers in 15 widely separated localities in British Columbia was one hour at 50° C. Shorter periods at this temperature caused a lag in the growth rate when the cultures were transferred to an incubator at 25° C. No permanent attenuation of vigour occurred as a consequence of maintaining the cultures at temperatures near the lethal point, the growth rates being temporarily inhibited, but the cultures afterwards re-acquiring their original vigour. Thus the effectiveness of the hot formaldehyde or hot mercuric chloride treatment depends entirely upon the greater penetration or the greater toxicity of the disinfectants at the higher temperatures and not upon any direct effect of heat upon the fungus. As potato tubers failed to make any significant growth after one hour's immersion in water at 50°, and were severely injured when immersed for the same period at 45°, a hot-water treatment is useless for the control of *C. solani*. Further, the sclerotia of the fungus germinated after being removed from tubers immersed for one hour at 55°, the lethal temperature period being one hour at 60°.

A procedure [which is described] was devised to establish the optimum temperature and the growth rate at any temperature as critical constants. The growth temperature graph for *C. solani* reaches zero at 6° and at 32° and shows an optimum growth rate at 25°; its shape indicates that the temperature coefficient progressively increases with decreasing temperature. When tube cultures were transferred from 8° to 25° a constant growth rate was not obtained until the fourth day.

ELMER (O. H.). **Pathogenic and cultural comparisons of strains of Rhizoctonia solani.**—Abs. in *Phytopath.*, xxii, 1, pp. 8–9, 1932.

Two main groups of strains of *Rhizoctonia* [*Corticium*] *solani* are distinguished, the most commonly found producing necrotic lesions on potato stems. The strains of the second group produce superficial, fleck-like lesions on potato stems and cause arrested apical growth of the emerging sprouts. Such plants form lateral sprouts of which the apical growth may in turn be checked. On artificial media the strains of this second group produce numerous small, white mycelial aggregations of a mealy appearance. Other strains outside these groups also occur.

TULLIS (E. C.). **Ophiobolus oryzinus on Rice in Arkansas.**—Abs. in *Phytopath.*, xxii, 1, p. 28, 1932.

Ophiobolus oryzinus, originally found by C. F. Baker on rotting straw in the Philippine Islands, has been shown to cause a disease of rice in Arkansas. In artificial inoculation tests, *O. oryzinus* was pathogenic on Fortuna and Blue Rose rice plants in the seedling and heading stages and on red rice in the former stage, some of the plants being killed outright, while others were injured through loss of leaf area. Infected plants did not produce tillers until after the heading of the first culm. The host was invaded by direct mycelial penetration of the epidermis of the basal leaves, appressoria being formed.

TULLIS (E. C.). **Helminthosporium sigmoideum, the conidial stage of Sclerotium oryzae.**—Abs. in *Phytopath.*, xxii, 1, p. 28, 1932.

Sclerotium oryzae, the causal organism of stem rot of rice [see above, p. 433], has been found by investigations in Arkansas to produce a conidial stage, which was identified as *Helminthosporium sigmoideum* [ibid., ii, p. 230]. Conidia of *H. sigmoideum* were also found in a herbarium specimen of *S. oryzae* collected in Italy by Briosi and Cavara. The genetic connexion of the two stages has been demonstrated in inoculations and in cultural studies with both stages. Blue Rose rice seedlings grown aseptically on maize meal agar in test tubes and inoculated with sclerotia of *S. oryzae* were killed by the fungus. Conidia of *H. sigmoideum* subsequently developed on these seedlings, germinated, infected fresh rice seedlings, and produced in them and on agar the typical sclerotia of *S. oryzae*. This entire life-cycle (sclerotia, mycelium, conidia, mycelium, sclerotia) has been followed under controlled laboratory conditions, as well as on plants grown aseptically on agar and in the soil.

Een nieuwe goedkoop toestel voor meeldauwbestrijding. [A new, cheap apparatus for mildew control.]—*De Bergcultures*, vi, 6, pp. 159–162, 1932.

Particulars are given of the construction and application of the German Sulfurator apparatus [*R.A.M.*, xi, p. 254], which it is hoped will prove useful in the control of rubber mildew [*Oidium heveae*: ibid., x, p. 749] in Java. The machine is obtainable from

the Schlieper Company at an inclusive price of 265 florins. Air is driven by a bellows through sulphur melted at a high temperature and carries the latter in a very finely divided cloud to a height sufficient to reach the crowns of the tallest rubber trees. The sulphur is deposited in finer and more evenly distributed particles than that from the ordinary dusting machines and adheres to the leaves very well even when rain falls on it. About 10 kg. sulphur can be liberated per hour. The machine weighs about 50 kg. and can be carried by two coolies.

PFÄLTZER (A.). **De Sulfurator.** [The Sulfurator.]—*De Bergcultures*, vi, 8, p. 202, 1932.

It is pointed out that no actual tests in rubber mildew [*Oidium heveae*] control have yet been conducted with the Sulfurator apparatus [see preceding abstract] in Java, so that any reports as to its efficacy for this purpose should be received with caution. Experiments in which sulphur was applied to the trees after the close of the mildew campaign indicate that, while the general principle of the apparatus is correct, there are various drawbacks connected with its use. Thus, the clouds of sulphur are readily dissipated by the wind, and the layer of sulphur deposited on the treated leaves is so thin as to be barely discernible. When these defects are remedied the machine should prove useful on economical grounds.

WAKSMAN (S. A.). **Principles of soil microbiology.**—xxviii + 894 pp., 15 pl., 1 fig., 3 diags., 79 graphs, London, Baillière, Tindall & Cox, 1931.

Although only four years have elapsed since the publication of the first edition of this standard work [*R.A.M.*, vi, p. 507], a number of changes are necessitated by the many contributions to the knowledge of the subject made during this period. In order to bring the book up to date, some of the chapters have been entirely rewritten, especially those dealing with the mycorrhizal fungi and the soil as a medium for plant and animal parasites, while new chapters have been added treating of the rôle of micro-organisms in the decomposition of organic matter in green and stable manures and in the formation and decomposition of peat and forest soils, as well as of the relation between plant growth and the activities of soil micro-organisms. The necessary condensation was effected by the omission of some of the text not directly bearing on the subject under consideration. As in the previous edition, the interdependence between the activities of micro-organisms and the chemical transformations in the soil is specially emphasized.

GEHRING (A.). **'Sand drown' Erkrankungen von Tabak und Mais in Abhängigkeit vom Kalk- und Magnesia-Gehalt des Bodens.** ['Sand drown' diseases of Tobacco and Maize conditioned by the lime and magnesium content of the soil.]—*Ernährung der Pflanze*, xxviii, 6, pp. 101–104, 1932. [English summary on p. 120.]

In connexion with his work at the Brunswick Agricultural

Experiment Station on the importance of magnesium as a fertilizer constituent, the writer examined 17 soil samples from North and South Carolina and Massachusetts, in which 'sand drown' of tobacco and maize was known to occur [*R.A.M.*, x, pp. 686, 761]. The results of this investigation confirmed previous observations to the effect that the magnesium-deficient soils predisposing to this disease are equally poor in lime, and a parallel is drawn between sand drown and the pathological symptoms exhibited by oats and rye on acid soils in Germany [ibid., xi, p. 101].

HINKS (G. R.). **Soil sterilizing plant at Carrington, Cheshire.**—*Gard. Chron.*, xci, 2355, p. 128, 1 fig. (on. p. 127), 1932.

A description is given of the soil sterilizing plant installed at the Central Propagating Department, Carrington, Cheshire, in 1930 for the Manchester Corporation. The plant is of the two-cell type, each cell being 4 ft. 9 in. long, 3 ft. wide, and 1 ft. 9 in. deep, and capable of holding a cartload of soil (about one ton). In each cell the steam is blown into the soil from three rows of galvanized pipes, 1 in. in diameter, the steam being kept on from 30 to 45 minutes; after treatment the soil is allowed to lie for a period of three weeks to three months. The cost of installation of the plant, including boiler, injector, feed tank, &c., was about £130. Steam is used at a pressure of about 80 lb. per sq. in. The consumption of coal, mixed with a small amount of coke, is about 1½ cwt. for an eight-hour day. Weeding costs are considerably reduced by soil sterilization on these lines, four men now being able to clear the same number of frames in one hour as formerly in four or five days, and the growth of the plants is greatly improved.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop in 1931.**—*Journ. Inst. of Brewing*, N.S., xxix, 1, pp. 37–44, 1932.

In 1931, owing to the persistent wet weather, the outbreaks of hop downy mildew [*Pseudoperonospora humuli*] were more severe than any hitherto experienced in England [cf. *R.A.M.*, x, p. 406]. In Kent the first basal spikes were observed on 15th April, and on 26th May infection of the lower leaves of the bine was noticed. Where the spikes were not properly removed and spraying was omitted or inadequately carried out, the leaves near the cones became infected and spores passed from them to the cones, turning the latter brown, while the burr (newly formed cones) was sometimes attacked and destroyed. Hundreds of acres had to be abandoned on account of downy mildew, and still more were picked unripe. Satisfactory control was again obtained in 1931 by three applications of Bordeaux mixture as previously recommended [loc. cit.]. The hops may safely be sprayed throughout the burr period, but on no account should the mixture be applied to the ripening cones [ibid., x, pp. 127, 687].

The alleged resistance of the Fuggles variety suffered a further decline in 1931, and growers are advised to spray this variety in future in order to secure a fully mature and healthy crop. During

the period under review, many Fuggles were picked long before ripening for fear of infection by mildew, with consequent loss of quality. In 1931 the well-known Saaz variety, hitherto regarded as virtually immune from cone infection by *P. humuli* [ibid., viii, p. 603], was also reported to be attacked in Czecho-Slovakia (*Petit Journ. du Brasseur*, xxxix, p. 1001, 1931).

BELL (A. F.). **Dwarf disease of Sugar-cane.**—*Queensland Bur. of Sugar Exper. Stations, Div. of Path. Bull.* 3, pp. 3–12, 6 figs., 1932.

This is a full account of the 'dwarf disease' of sugar-cane in the Mackay district of Queensland, apparently confined to about a dozen farms, a summarized description of which has already been noticed from another source [*R.A.M.*, xi, p. 326]. In addition to the information contained in the previous paper, it is stated that histological examination showed that in the extremely stunted, grass-like plants resulting from primary infection, the major vascular bundles of the leaves may be considerably enlarged, very irregular in shape, and frequently fused with an adjoining minor bundle. As a rule, the chlorophyll-bearing sheath is incomplete and may be reduced to a very few cells; in extreme cases it may even be completely absent. Within the bundle there is an abnormal development of comparatively thin-walled lignified cells which frequently radiate through the bundle in two or more strands, bringing about distortion and altering the relative positions of the component tissues. Phloem may be almost completely absent and confined to one of the resultant sectors, or may be found scattered in more than one sector at the ends of the lignified strands. No definite abnormalities were seen in either stems or leaves of plants exhibiting what is believed to be secondary infection, in which the symptoms appear at some stage in the growth of the plant after the canes have formed.

So far all attempts to isolate a micro-organism from the diseased plants have given negative results, and all indications point to the disease belonging to the virus group. No correlation was established between the occurrence of the trouble and any particular soil type. There was some evidence to show that there is no prolonged masking of symptoms in the case of primary infection, and if this view is correct, comparatively slow secondary spread has been observed in a number of fields during the months of March and April. Attempts at mechanical transmission of the disease by Sein's method [ibid., ix, p. 678] have so far given negative results.

To prevent a dangerous spread of the trouble it is recommended carefully to examine all fields, especially those planted with P.O.J. 2714, P.O.J. 213, E.K. 28, and H.Q. 426 (Clark's Seedling) intended to serve as a source for further planting, and to reject all those in which even a single diseased stool is found. The disease has not been definitely proved to occur on the two last-named varieties, but suspicious symptoms have been reported on them.

[This paper is reproduced in *Queensland Agric. Journ.*, xxxvii, 1, pp. 9–17, 1932.]

Cottrell-Dormer (W.). **Red-stripe disease of Sugar-cane in Queensland.**—*Queensland Bur. of Sugar Exper. Stations, Div. of Path. Bull.* 3, pp. 25–59, 1 col. pl., 11 figs., 1932.

This report is divided into two main sections, the first of which gives a full account of the author's investigation of the red stripe disease of the sugar-cane in Queensland. The results indicate the identity of this disease with the previously described local form of top rot [*R.A.M.*, x, p. 339], since symptoms characteristic of both were produced by inoculations with the causal bacterium, which was subsequently re-isolated from the experimental lesions. The most destructive form of the disease would appear to result from infection through the semi-mature internodes, while the mature portions of the sugar-cane stems appear to be much less susceptible.

The second section deals with the morphological and cultural characteristics of the organism responsible for the disease, whose index number, according to the 1929 descriptive chart of the Society of American Bacteriologists, is 5020–32020–1000. In spite of some minor differences, the Queensland organism is considered to be identical with *Phytomonas rubrilineans* [ibid., v, p. 133]. Its chief differences from the previous descriptions are that it does not liquefy gelatine and it turns milk alkaline. Its thermal death point was found to be about 51° C., and it was shown to be unable to survive ten minutes' exposure to direct sunlight. When kept in a dry cardboard box it retained its viability for a period of seven months, but attempts to isolate it from lesions which had been exposed to all kinds of weather for some three or four months in the field, gave negative results. Inoculation tests established the pathogenicity of the organism under controlled conditions to sorghum and broom millet [*Andropogon sorghum*], Sudan grass (*Sorghum sudanensis*) [*A. sorghum* var. *sudanensis*], Johnson grass (*S. halepense*) [*A. halepensis*], Tambuki grass (*S. verticilliflorum*), a native grass (*S. plumosum*) [*A. australis*], and maize.

The author also gives a brief description of a disease widely distributed in Queensland cane-growing areas, which he tentatively calls mottled stripe since its symptoms very closely agree with those of the mottled stripe disease described from Louisiana, and both are caused by a slightly curved, rod-shaped organism (*P. rubrisubalbicans*) [ibid., x, p. 129], with polar flagella. In Queensland (where it is so far of no economic importance) it occurs chiefly on the Badila cane which is considered to be resistant in Louisiana. In contradistinction to red stripe, the leaf lesions of mottled stripe are a pale yellow speckled to a greater or lesser extent with vermilion, and they bear no bacterial exudate; sometimes the stripes are almost entirely yellow, and at other times vermilion is the predominant colour. Mottled stripe has not yet been observed to produce a top rot of the sugar-cane.

[This paper is reproduced in *Queensland Agric. Journ.*, xxxvii, 1, pp. 23–40, and 2, pp. 98–114, 1932.]

Ciferri (R.). **The criteria for definition of species in mycology.**—*Ann. Mycol.*, xxx, 1–2, pp. 122–136, 5 diags., 1932.

In connexion with a discussion on the ambiguity of the standards

in current use for the classification of fungi [cf. *R.A.M.*, ix, p. 492], the writer proposes three alternative criteria, based primarily on his studies on the Ustilagineae but applicable with certain modifications to other groups, viz., (1) the indication, by means of some recognized abbreviation, of the kind of species intended, e.g., m. for morphologic, ec., ecologic, pa., pathographic (effect of the parasite on the host as well as reaction of the latter to the parasite), and cu., cultural; (2) the arrangement of the different kinds of 'species' as inferior units of the 'mother species' or 'Sammelspecies' according to an agreed conventional scale; and (3) the adoption of trinary nomenclature, this being in the writer's opinion the most feasible suggestion and the one involving the minimum of radical changes.

THOROLD (C. A.). **A further preliminary list of Trinidad fungi.**—30 + viii pp., Government Printing Office, Port-of-Spain, 1931.

The first section of this pamphlet gives a list of the parasitic and saprophytic fungi collected up to 1930 in Trinidad, together with their synonymy and notes on their geographical distribution. The second section is an enumeration of the fungal and bacterial diseases of cultivated and other plants occurring in that island, arranged by their hosts. Both the fungi and their hosts are also indexed in alphabetical order.

WALLACE (G. B.). **Preliminary list of fungi or diseases of economic plants in Tanganyika Territory.**—*Kew Bull. Misc. Inform.*, *1932*, 1, pp. 28–40, 1932.

A list is given, in alphabetical order of the hosts, of the fungi and diseases (physiological and virus) affecting 58 plants of economic importance in Tanganyika Territory. The records (all of which have been made since 1927) are furnished with the author and reference to the original description, and the locality and date of collection.

SYDOW (H.). **Fungi chilenses a cl. E. Werdermann lecti. Pars secunda.** [Chilean fungi collected by E. Werdermann. Part II.]—*Ann. Mycol.*, xxx, 1–2, pp. 81–90, 1932.

Taxonomic and critical notes are given on twelve species of fungi (of which seven are new) collected in Chile, mostly on woody plants [cf. *R.A.M.*, vii, p. 673]. The new species are furnished with diagnoses in Latin and German.

SYDOW (H.). **Novae fungorum species—XXI.** [New species of fungi—XXI.]—*Ann. Mycol.*, xxx, 1–2, pp. 91–117, 1932.

Latin and German diagnoses, with critical notes, are given of 24 new species of fungi collected in Germany, India, China, Siam, the Philippine Islands, and Brazil [cf. *R.A.M.*, x, p. 342]. *Septoria carvi* n. sp., found producing spherical, yellowish or brownish spots and killing the leaves of *Carum carvi* in Westphalia, is characterized by depressed, globular pycnidia, 60 to 100 μ in diameter, with a simple, usually irregular pore, the membrane composed of 1 to 3 layers of thin-walled, very light olive-brown cells; and straight or rarely slightly curved, hyaline conidia, 18 to 45 by 0·8 to 1·3 μ, borne on conidiophores 2 to 3 μ in length.

CHRISTOFF (A.). Нѣколко нови растителни болести за България. [Some plant diseases new to Bulgaria.]—Reprinted from *Renseignements Agricoles*, Sofia, xi, 11–12, 18 pp., 3 figs., 1930. [German summary. Received May, 1932.]

This is an annotated list of plant parasitic bacteria and fungi [including three new species] which have been recorded of recent years, for the first time in Bulgaria. The bacteria include *Bacterium mori* on the mulberry [*R.A.M.*, x, p. 347], *Bact. papavericola* on the opium poppy [ibid., ix, p. 456], and *Bact.* [*Pseudomonas*] *pisi* [ibid., ix, p. 700] on the pea; artificial inoculations showed that under warm and moist environmental conditions the disease caused by the last-named organism takes only two days to develop.

Leptosphaeria dianthi n. sp. was found on the leaves of *Dianthus tristis* in association with *Alternaria dianthi* [ibid., x, p. 438], on the spots of which it formed small, black, dispersed, at first submerged and later erumpent perithecia, up to 50 μ in diameter, with a papillate ostiole. The asci are clavate, broadly cylindrical when mature, and 68 to 85 by 15 to 20 μ; they contain eight subdistichous, yellowish, oblong-ellipsoidal, straight or slightly bent, three- (rarely four-) septate spores, slightly constricted at the septa, and measuring 25 to 38 by 7·8 to 10·6 μ. *Aecidium anchusae*, the aecidial stage of *Puccinia dispersa* [*P. secalina*], was recorded on *Anchusa officinalis*. *Polyporus hispidus* was observed killing branches of the apple and of a species of *Juglans*. *Phyllosticta ruborum* was found causing leaf spots on a species of *Rubus*, and *Septoria ribis* [*Mycosphaerella grossulariae*] on red currants (*Ribes rubrum*). In 1928 black cherries (*Prunus avium*) in the markets were seen to be rather severely attacked by *Cladosporium carpophilum*. *Ascochyta pisi* was found on *Onobrychis sativa*.

ROSSI (V.). **Contributo allo studio della patologia vegetale in Somalia.** [A contribution to the study of plant pathology in Italian Somaliland.]—*Agricolt. Colon.*, xxv, 11, pp. 522–528, 1931.

In Italian Somaliland plant diseases are most prevalent towards the end of the hot, wet season and the beginning of the cool season, which is marked by light rains. During this period the following records were made.

Cercospora dolichi caused circular, rugose, reddish spots on the upper surface of the leaves and on the stems of cultivated *Dolichos* [? *lablab*], the old leaves, which were those most affected, withering and falling. The disease is capable of causing much damage.

Cotton grown from Egyptian seed showed a wrinkling of the leaves with ulcerations on the veins and stems, while the leaf stalks were cracked and scaled, similar lesions being present in places on the leaf blades but unrelated to the wrinkling. The nectaries at the base of the main veins were attacked on the under surface by sooty moulds. Other leaves of the same cotton were infected by *Uredo gossypii* [*Cerotelium desmium*].

Mulberry leaves were attacked by *Cercospora moricola*. At first they showed a sort of mosaic consisting of small, hyaline, polygonal

spots evenly distributed over the whole of the under surface; these gradually darkened, and in very advanced stages spots of a dirty chestnut colour were noted on the upper surface. The oldest leaves suffered most, but the stalks and branches remained unaffected. Mulberry leaves with greenish-black spots showed the presence of a *Clasterosporium*. Other mulberry plants, especially those exposed to the wind, were affected by a condition referred to as 'silver leaf', which attacked mostly the leaves nearest the soil, which were very wet, as the ground was irrigated by flooding. At first, the upper surface showed greyish, irregular, indefinitely outlined spots, which gradually developed into the silvery condition. Beneath the silvery areas the under surface of the leaf was concave. Affected leaves became irregularly perforated, rough, hard, and brittle. The condition was due to an abnormal accumulation of calcium oxalate in the epidermal cells (which were eventually killed) and is attributed to physiological disturbances probably due to a virus disease.

LANGERON (M.) & TALICE (R. V.). **Nouvelles méthodes d'étude et essai de classification des champignons levuriformes.** [New methods of investigation, and an attempt at the classification of yeast-like fungi.]—*Ann de Parasitol. Humaine et Comp.*, x, 1, pp. 1–80, 5 pl., 32 figs., 1932.

In the introductory part to this paper the authors give a brief historical outline of the various systems hitherto suggested for the classification of yeast-like fungi, some of which are important human and animal pathogens, and state their reasons for agreeing with Mlle Berkhout [*R.A.M.*, iii, p. 555] in her creation of the genus *Candida* to include the forms which had been previously referred to *Monilia* Gmelin. On general lines they accept the classification proposed by Ciferri and Redaelli [ibid., viii, p. 676], but point out that the division by these workers of the yeast-like fungi into two main groups based on whether they produce or do not produce filaments in culture is not substantiated by their own studies [considerable details of the technique of which are given]. In their experience the formation of mycelial filaments is very capricious and depends on a large number of external factors; under certain conditions it was found that the filaments were formed more readily in liquid than on solid media, and on the latter inside the medium rather than on its surface. They proceed to show that these filaments represent a definite sporogenous (but not conidial) apparatus with specific morphological characters which they suggest using as a basis for the botanical classification of the organisms.

The organisms investigated by the authors are all referred to the section Mycotorulaceae of Ciferri's and Redaelli's family Torulopsidaceae [loc. cit.]; they are divided into two main groups, the first of which forms creamy colonies in culture and includes five genera, namely, *Mycotorula*, characterized by blastospores disposed in simple and regular verticils or clumps; *Mycotoruloides*, with blastospores disposed in regular, composite, and spread out verticils and terminal clumps; *Candida*, with blastospores disposed in terminal chains and in more or less regular verticils; *Mycocandida*, with a very branched filamentous apparatus, short

terminal chains of spores, and rudimentary verticils; and *Blastodendrion*, characterized by arbuscular formations consisting of stalagmoid blastospores. The second group, *Geotrichoides*, forming membranaceous colonies, only comprises one genus, namely, *Geotrichum*, characterized by the presence of a true mycelium which breaks up into arthrospores, and the absence of blastospores; it forms a solid film on the surface of liquid media. A key to these genera is appended.

HANSEN (H. N.) & SMITH (R. E.). **An analysis of variation in Botrytis cinerea by single-spore cultures.**—Abs. in *Phytopath.*, xxii, 1, p. 11, 1932.

Twenty-five monospore cultures were made from each of eight duplicate monospore cultures of 47 strains of *Botrytis cinerea* or closely related types isolated from various plants. In a few of these cultures considerable variation appeared in regard to the presence or absence of sclerotia, conidial production, colour and type of mycelium, and other features of gross morphology. In one strain (X) 24 of the cultures (x) appeared uniform and like the parent, while 1 (a) varied in absence of sclerotia and in mycelial type. Further studies were made on potato-dextrose agar cultures of this strain to the F_4 generation, during which period x remained uniform throughout, while in the F_1 generation a separated into 7 (28 per cent.) like the parent and 18 (76 per cent.) of an entirely new type (b). The latter continued uniform to the F_4 generation. In the F_2, a separated into 12 (48 per cent.) of a, 7 (28 per cent.) of b, and 6 (24 per cent.) of a new type (c). In the F_3, a separated into 2 (8 per cent.) of x, 15 (60 per cent.) of a, 5 (20 per cent.) of c, and 3 (12 per cent.) of a new type (d). Type c separated into 1 (4 per cent.) of x, 14 (56 per cent.) of a, and 10 (40 per cent.) of c. Species of *Phoma*, *Fusarium*, and *Ramularia* behaved similarly.

JOCHEMS (S. C. J.). **Verslag van het Deli Proefstation over het jaar 1931.** [Report of the Deli Experiment Station for the year 1931.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, lxxiv, 53 pp., 1932.

This report contains the following references of phytopathological interest. To the list of plants liable to infection in Sumatra by slime disease [*Bacterium solanacearum*: *R.A.M.*, viii, p. 74] may now be added *Gynura* sp., *Gerbera* sp., and *Chrysanthemum sinense*. All the F_2 seedlings of crosses between Deli tobacco and *Nicotiana* species [other than *N. tabacum*], as well as back-crosses of the F_1 with Deli tobacco, showed an exceptionally high percentage of slime disease [ibid., x, p. 561].

Leaf spot (frog-eye) [*Cercospora nicotianae*: ibid., xi, p. 134] has been found to attack transplanted tobacco seedlings and also ripe seed capsules. In a preliminary pot experiment, a heavy application of nitrogen resulted in an increased incidence of the type of leaf spot associated with the curing stage [loc. cit.] while the white, membranous spots ordinarily occurring on plants in the field were less in evidence.

Various forms (about six) of the virus disease of tobacco

known as 'peh-sim' have been observed. Experiments in the transmission of 'gilah' [see next abstract], another virus disease, by means of grafting, gave positive results both when healthy scions were grafted on diseased stocks and vice versa. The 'korab' disease was found to be similarly transmissible from infected to healthy scions and vice versa.

Glomerella lycopersici Krüger, *Botrytis verrucosa* v. Beyma, and *Botryodiplodia theobromae,* isolated from cured tobacco of inferior quality, were found capable of causing a wet rot of freshly gathered leaves on inoculation into the midrib. Both the top rot of fully matured field tobacco and the decay of stalks ['hollow' or 'drip stalk'] in the barn were found on examination by Prof. Nakata to be due to *Bact.* [*Bacillus*] *aroideae* [ibid., viii, p. 554; ix, pp. 614, 747].

THUNG (T. H.). **De krul- en kroepoek-ziekten van Tabak en de oorzaken van hare verbreiding.** [The curl and crinkle diseases of Tobacco and the causes of their dissemination.]—*Proefstat. Vorstenlandsche Tabak, Meded.* 72, 54 pp., 30 figs., 3 diags., 1932. [English summary.]

The so-called 'kroepoek' ('crinkle') diseases of tobacco, which cause considerable damage in Java by reducing the yield of the crop and impairing the quality of the finished product, are considered to be probably identical with the 'Faltenzwerg' of Peters and Schwarz (*Mitt. K. Biol. Inst. für Land- und Forstwirtsch.*, 13, 1912), the 'gilah' of Jochems [see preceding abstract], the 'kroepoek' and 'krekoh' of Keuchenius (*Meded. Besoeki Proefstat.*, 14, 1915) and others [see also *R.A.M.*, ii, p. 9], the 'crinkle' of Roberts (*Bull. Entomol. Res.*, xxi, p. 169, 1930), and the 'crinkly dwarf' of Storey [*R.A.M.*, xi, p. 76].

Three types of 'kroepoek' may be differentiated, viz., (1) the common kroepoek, in which the leaf edges are curled in places towards the dorsal side, and show thickenings and outgrowths (enations) of the veins; (2) curl disease (krulziekte), characterized by the curling of the whole leaf edge towards the dorsal side, with enations of the veins, the lamina arching towards the ventral side between the finer veins and the distance between the latter being much reduced; and (3) the transparent kroepoek, distinguished by the curling of the leaves towards the ventral side and the clearing of the veins, enations being absent. The first symptoms of kroepoek may appear on a part only of a single leaf, but all the new leaves subsequently formed show the disease. The disease, therefore, is systemic.

Sections through a thickened vein of a kroepoek leaf show that the cortical parenchymatous cells contain an abnormally large amount of chlorophyll; if leaf appendages arise a long palisade parenchyma is formed along the original dorsal side, while cortical cells without chloroplasts are no longer present. The regular structure of the healthy vein has entirely disappeared; the epidermal cells are of very unequal size, and in addition to the proliferation of the mesophyll a very unevenly distributed multiplication of the phloem is apparent, while the wood vessels become irregularly scattered. In a healthy tobacco vein the vascular bundle is bicollateral and at the outer side of the phloem is a

band of collenchymatous pericycle. The sieve-tubes and companion cells have relatively wide lumina. In a kroepoek-diseased vein, on the other hand, the sieve-tubes are compressed, the cell walls swollen, and the remnants of the pericycle are surrounded by the enlarged and necrotic phloem tissue.

In curl disease there are more layers of densely aggregated spongy parenchyma cells with few intercellular spaces than normal. 'Transparent kroepoek' differs from the other two types in the absence of chlorophyll from the cortical cell tissue, except in the starch sheath. The number and size of the parenchyma cells are increased and chlorophyll is also absent from the outermost subepidermal cell layer. The 'transparent' effect is produced by the widely extended parenchyma without chloroplasts. Here, too, the phloem is necrotic.

Each of the above-mentioned diseases is transmissible by grafting, but not by means of the juice of infected plants; they are not transmissible by the seed. Diseased plants are found chiefly near villages or the curing barns; in places the incidence of infection may reach 50 to 70 per cent. Infection does not originate in the soil, as shown by the fact that plants grown in pots with soil from infested village areas and then placed in the field do not contract the disease, while those grown in sterilized soil and transferred to the neighbourhood of infected villages develop the kroepoek symptoms. The dissemination of infection by means of some aerial agency is further proved by the fact that plants grown under fine-mesh cages remain healthy, while those in large-mesh cages become diseased.

Experiments under controlled conditions in the transmission of the kroepoek group of diseases by various insects, including thrips and the aphid *Myzus persicae*, gave positive results only in the case of the white fly (Aleurodidae), a species of *Bemisia* being probably implicated [cf. ibid., xi, p. 238]. The three types described above remain constant with insect transmission as well as grafting. The incubation period in graft infections is about 4 weeks. In one of the tests with Aleurodidae 235 insects were introduced from naturally infected tobacco on to 42 plants in pots in the greenhouse between 30th September and 6th October, 1931, 22 of the plants being found diseased on 18th October and 33 on 11th November. Six of the latter had curl and the rest the ordinary kroepoek. Kroepoek symptoms were induced in tomato plants by grafting diseased tobacco tops on them, and infection was further transmitted by white flies from diseased tobacco to *Nicotiana glauca* and *N. rustica*. Malformations strongly reminiscent of kroepoek have frequently been observed near Klaten on the wild plant *Synedrella nodiflora* and the extensively cultivated *Zinnia elegans*; two white flies were transferred, after three days' feeding on diseased *Zinnia*, to a healthy tobacco plant which developed kroepoek in 14 days.

The number of white flies on tobacco was found to increase on the outskirts of the villages and to be larger on young than on older plants. Statistical observations on the epidemiology of kroepoek indicate that the percentage of infection in the Aleurodidae remains constant throughout the tobacco season.

DUFRÉNOY (J.). **La formation de tetraèdres d'oxalate de calcium dans les cellules de Tabac affectées par le Bacterium tabacum.** [The formation of tetrahedra of calcium oxalate in the cells of Tobacco affected by *Bacterium tabacum.*]—*Comptes rendus Soc. de Biol.*, cix, 8, pp. 608–610, 2 figs., 1932.

The vacuoles of the green cells of normal tobacco leaves, and especially those of the hairs, are known to be rich in the monoclinic crystals known as 'sand crystals' [*R.A.M.*, viii, p. 15], the vacuolar juice being more acid than P_H 5 (probably close to P_H 4). In leaves infected by *Bacterium tabacum*, the acidity of the vacuolar juice appears to be diminished, judging by the plentiful formation of tetragonal crystals of neutral oxalate in the vacuoles of the cells within the affected areas. The spots rapidly expand during rainy weather, when the bacterial zoogloeae penetrate between the cells, which remain alive and retain their chondriosomes and chloroplasts while forming an excess of oxalate in their vacuoles. On the other hand, the lesions tend to cicatrization during sunny weather by the formation of an annular cushion involving several layers of parenchymatous cells, of which the large central vacuole is filled with phenolic compounds and tetrahedra of calcium oxalate.

MEURS (A.). **Bestrijden en voorkomen van topziekte.** [Control and prevention of top disease.]—*Deli Proefstat. te Medan-Sumatra Vlugschr.* 59, 3 pp., 1932.

Full directions are given for the preparation and application of the boric acid solution which has proved so effective in the control of top rot of tobacco in Sumatra [*R.A.M.*, x, p. 561]. The results of recent tests have shown that a dose of 6 mg. of boric acid per plant dissolved in ½ l. of water (solution is easier in water heated to 45° to 50° C.) is necessary to ensure complete control. For the prevention of the disease on a large scale on white, subhydric soils, the boric acid solution should either be poured into the plant holes or applied to the seedlings immediately after setting.

Legislative and administrative measures.—*Internat. Bull. of Plant Protect.*, vi, 2, p. 28, 1932.

ITALIAN SOMALILAND. By a Decree of 14th March, 1931, a Phytopathological Service was instituted for Italian Somaliland under the Office of Agriculture, with the following duties: (*a*) to conduct microbiological, pathological, and zoological research as applied to agriculture; (*b*) to provide for the supervision of the nursery and other establishments concerned in commercial plant production; (*c*) to arrange for the distribution of information relating to plant diseases and pests and their control; (*d*) to supervise the importation and exportation of plants with a view to preventing the introduction of new diseases and pests and the spread of those already present; and (*e*) to issue certificates relating to the health and origin of plant consignments.

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McClean (A. P. D.). **Bunchy top disease of the Tomato.**—*S. Africa Dept. of Agric., Sci. Bull.* 100, 28 pp., 8 pl., 1931.

This is the full account of the bunchy top disease of the tomato in South Africa, a brief abstract of which has been noticed from another source [*R.A.M.*, xi, p. 209]. The trouble is stated to be more or less generally distributed throughout the low-lying districts of the eastern Transvaal, but has not been so far reported from outside this area. Macroscopically it closely resembles the American curly top of tomato described by Chupp ('Manual of vegetable garden diseases,' p. 597), but is quite distinct from yellows [ibid., xi, p. 210]. The most characteristic symptoms are severe stunting of the entire plant, a necrosis of the stems and leaves, and various forms of leaflet distortion, such as curling and abnormal unevenness of the surface. Under certain conditions the leaves may unfold in a partially chlorotic state, but later the foliage rapidly assumes a uniform green colour; mosaic mottling was never observed either in the field or in the greenhouse. A peculiar feature of the disease is that the check caused by it to the elongation of the internodes is limited to the early stages of infection; this is followed by a definite lengthening of the internodes with a somewhat spindling type of growth, the resulting plants showing three well-differentiated regions, namely, an apparently normal lower region, a middle region characterized by the condensation of the axis, and an apical region with elongated thin internodes and small leaves. Necrosis, which is characterized by the appearance of brown or black streaks along the under surface of the rachis and leaflet veins and on the stems, is chiefly a symptom of the early stages of the disease; it develops with greatest severity on the leaves showing the first signs of stunting, and diminishes towards the upper portions of the plant. Diseased plants produce apparently normal flowers, and the setting of the fruit is not inhibited, but the yield is considerably reduced and the tomatoes that reach maturity are small and frequently distorted; these fruits are either seedless or contain a few small seeds, only a proportion of which may be fertile. Fruits that are formed before infection of the plant are not appreciably affected. It was shown that the disease develops in its most typical and severe form under environmental conditions which favour vigorous growth of the healthy plant.

The disease was readily transmitted to healthy tomato plants by grafting, juice inoculation, and by rubbing the leaves and stems with macerated tissue of diseased plants, but inoculation of the roots consistently failed to give positive results, and a limited number of tests of seed and soil transmission also failed. So far no insect vector of the disease has been demonstrated in the author's tests, but their agency in transmission is not excluded. The infectious principle was shown to be generally distributed throughout the whole plant, including the roots, with the exception of the old, outwardly normal leaves; it was apparently removed by passage through a paper pulp filter which allowed ordinary tobacco mosaic to pass freely. Attempts to transmit the disease to tobacco (Joiner variety) by grafting or leaf mutilation gave negative results, but it was successfully transferred to *Physalis peruviana* and back to tomato.

It is thought probable that the main source of infection in the field is the presence of diseased tomato plants of previous crops, and possibly of Solanaceous weeds, e.g., *Physalis*. Normally, the incidence of the disease in the field is low; the comparatively few serious outbreaks so far reported have been localized, and are believed to have been due either to seed-bed infection or accidental contamination of the seedlings during transplanting. The paper terminates with some recommendations for the control of the trouble.

STRZAŁKOWSKA (HALINA). **Zgnilizna wodnista Pomidora.** [Watery rot of the Tomato.]—*Acta Soc. Bot. Poloniae*, vii, 4, pp. 599–614, 1930. [French summary. Received May, 1932.]

This is a brief account of a watery rot which in 1928 and 1929 was frequently found destroying tomatoes in the markets of Warsaw. It is distinct from similar rots reported from other countries [the characters of which are briefly described], in that the lesions apparently start at any point of the surface of the fruits, presumably through microscopical ruptures in the cuticle, since inoculation tests showed that the causal organism is unable to penetrate the uninjured skin. The infection gradually spreads until the whole fruit is reduced to a semi-transparent liquid mass with a peculiar acid (but not putrid) smell. Besides numerous yeast-like organisms (which were shown to be non-pathogenic), isolations from the rotting tomatoes yielded a short (1·12 by 0·75 μ), non-motile, non-sporulating, Gram-negative rod, usually occurring in pairs but sometimes isolated and occasionally disposed in short chains. It grew best on tomato juice agar and on carrot, on which it formed rounded, mucous, yellowish-white colonies with a glistening surface. Cultural studies [details of which are given] showed that the organism develops better on solid than in liquid media; it does not liquefy gelatine or coagulate milk, and cannot utilize starch; of nitrogenous substances it can only utilize proteins and peptone, the latter only in the presence of sugar. Its temperature range for growth is from 5° to 37° C., with an optimum between 22° and 26°. It is considered to be new to science and the name *Bacterium lycopersici vitiati* K. Bassalik et H. Strzałkowska is suggested for it. A brief Latin diagnosis is appended. Typical

watery rot was produced in healthy tomatoes inoculated with pure cultures of the bacterium, which was reisolated from the infected fruits.

BREMER (H.). **Zur Frage der Beizung von Tomatensaatgut.** [On the question of Tomato seed disinfection.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 1, p. 2, 1932.

Frl. Niethammer has shown [*R.A.M.*, x, p. 256] that the *dosis tolerata* of uspulun [-universal] for tomato seed (one hour's immersion) is 0·01 per cent. The following values were obtained by Josefowicz (*Ann. Appl. Biol.*, xvii, p. 504, 1930); formaldehyde (10, 15, and 5 minutes' immersion) 2, 1, and 1 per cent., respectively; peroxide of hydrogen (30 minutes) 20 per cent.; corrosive sublimate (10 minutes) 0·05 per cent.; copper sulphate (15, 20, 50, 100, and 200 minutes) 10, 5, 2, 1, and 0·5 per cent., respectively; hot water (15 hours and 1 hour) 46° and 50·5° C., respectively; dry heat (3 days) 50° to 79·5°. Germination was retarded by copper sulphate and peroxide of hydrogen. In view of the extension of two seed-borne tomato diseases in Germany (*Didymella lycopersici* and *Aplanobacter michiganense*) [ibid., x, p. 764], the seed disinfection problem is becoming acute.

VANINE (S. I.). Болезни сеянцев и семян лесных пород. [Seed and seedling diseases of forest trees.]—152 pp., 86 figs., Гос. Издат. С.-хоз. и Колхозно-Кооп. Литературы. [State Publishing Office of Agric. and Collective Farming Co-operative Literature], Leningrad, 1931. [Received May, 1932.]

This rather elementary manual, meant for the Russian student of forest pathology, gives brief accounts of the principal physiological and parasitic diseases that attack coniferous and deciduous nursery seedlings in European and Asiatic Russia, and also of those that are caused by adverse environmental conditions. The great majority of the parasitic diseases [an index of which, arranged by the scientific names, is appended] are well known. Keys are given for the identification of species of *Penicillium* and *Aspergillus* in pure culture. Considerable space is given to control measures and to the description of spraying and dusting apparatus. A few of the illustrations are original, and the bibliography appended covers about 250 titles.

GROSSMANN (HELEN). **Das Ulmensterben.** [The die-back of Elms.]—*Schweiz. Zeitschr. für Forstwesen*, lxxxiii, 2, pp. 49–59, 2 pl., 1932.

An account (based on Dutch and German researches) is given of the symptoms of die-back of elms (*Graphium ulmi*), which is now reported to occur in Switzerland in addition to other European countries and the United States; its connexion with the bark beetles, *Scolytus scolytus* and *S. multistriatus*; and the direct, indirect, and biological measures for its control [*R.A.M.*, xi, p. 409].

BUISMAN (CHRISTINE J.). **Verslag van de phytopathologische onderzoekingen over de Iepenziekte, verricht in het Laboratorium 'Willie Commelin Scholten', gedurende 1931.** [Report

of the phytopathological investigations on the Elm disease conducted in the 'Willie Commelin Scholten' Laboratory during 1931.]—*Tijdschr. over Plantenziekten,* xxxviii, 2, pp. 17–36, 1932.

During 1931 the writer, with the assistance of Miss J. C. Went, made further tests of the reaction of different species and varieties of elms to infection by *Graphium ulmi* [*R.A.M.*, x, p. 695].

A high degree of susceptibility was again shown by *Ulmus americana*, *U. fulva*, *U. serotina*, *U. elliptica*, *U. japonica* (which had given some promise of resistance in the previous trials), *U. foliacea*, *U. glabra*, *U. hollandica*, and *U. procera*. However, a number of seedlings of *U. foliacea* of French and Spanish origin have failed to take the infection for three consecutive years. *U. glabra* var. *fastigiata* and *U. hollandica* var. *vegeta* were resistant. Of the Asiatic species *U. laciniata* and *U. turkestanica* were susceptible, while *U. pumila*, *U. pumila* [var.] *pinnato-ramosa*, *U. parvifolia*, and *U. wilsoniana* proved highly resistant. Indications of resistance were also given by *U. davidiana* and the so-called 'Karagatch' elm (possibly identical with *U. pumila* var. *arborea*). *Zelkova serrata* appears to be highly susceptible to infection by *G. ulmi*.

Experiments on water transport in elm tissues, using the fluometer method [ibid., iii, p. 234], showed that diseased branches are scarcely able to allow the passage of any water, the vessels being mechanically obstructed, not by the fungus but by tyloses and gum.

G. ulmi was isolated from every sample of frass from the bore holes in diseased elms in which *Scolytus scolytus* had been feeding.

Inoculation experiments with the close relative of *G. ulmi*, *G. penicillioides* [ibid., x, p. 71], on *U. americana* gave negative results.

In order to ascertain whether the wood of resistant varieties contains a substance that impedes the growth of *G. ulmi*, four strains of the fungus were placed on sterilized living fragments of branches of *U. americana*, *U. pumila*, *U. parvifolia*, and others. Good growth occurred in every case except on *U. americana*, indicating the general absence in resistant varieties of any substance adverse to the development of *G. ulmi*.

The spores of the fungus were found to tolerate about two months' desiccation at room temperature without loss of viability, so that they could be readily conveyed by wind from diseased to healthy trees.

It was found impossible to modify the course of the disease by exposing the young trees to varying temperatures and humidities in warm and cold frames, or by removing the leaves.

[This paper is also published as *Iepenziekte-Comité Meded.* 10, 20 pp., 1932.]

WESTERDIJK (JOHANNA), BUISMAN (CHRISTINE), & DOORENBOS (S. G. A.). **Wat kunnen Nederlandsche boomkweekers doen in verband met de Iepenziekte?** [What can Dutch arboriculturists do in connexion with the Elm disease?]—*Tijdschr. over Plantenziekten,* xxxviii, 2, pp. 37–40, 1932.

Recommendations are made for the replacement of the elm

varieties commonly grown in Holland, which are susceptible to the 'elm disease' [*Graphium ulmi*], by resistant ones, e.g., some types of *Ulmus foliacea*, *U. glabra* var. *fastigiata*, *U. hollandica* var. *vegeta*, *U. pumila*, *U. wilsoniana*, and *U. parvifolia* [see preceding abstract]. Any of the above-mentioned are suitable for park and street cultivation, but for planting along country roads and dykes it is advisable to obtain individuals of *U. foliacea* combining resistance to the elm disease with vigorous growth and large leaves.

PETRI (L.). **Il metodo d'isolamento della 'Phytophthora cambivora'.** [The method of isolating *Phytophthora cambivora*.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 3, pp. 214–221, 3 figs., 1931.

The isolation of *Phytophthora cambivora* [*R.A.M.*, x, p. 122] from chestnuts affected with ink disease is best carried out in spring, as or just before the buds break, from trees not over 30 years old, and showing signs of wilting on one side. When the necrosed areas (which taper upwards to a point) have been located by removing the bark at the base of the trunk on the side bearing the withered branches, small, thin, rectangular pieces of bark and sapwood cut with the long side parallel to the fibrovascular bundles are taken from the apex or sides of an affected area, each piece consisting of a diseased and healthy portion of cambium. The demarcation between the two portions is often quite distinct, the diseased part being somewhat sunken; from such pieces *P. cambivora* cannot be isolated. If, however, the darkened tissue is bordered on the side near the healthy portion by a narrow livid zone shading off into the yellowish-white of the healthy tissue, then the fungus may be isolated from this intermediate zone. In examining the pieces the bark should be removed in the laboratory, as the healthy tissues when exposed to the air oxidize rapidly and become therefore difficult to distinguish from the diseased ones; the isolations should be made on the day the pieces are cut, if possible on the spot. After being cut, the pieces are quickly and aseptically removed to carrot agar decoction treated with malic acid and prepared at a temperature not over 100° C.; at least six isolations are made from each piece, and the cultures are kept at 15° to 18°.

In conclusion, the author points out that an additional symptom to the withering of the branches and the characteristic black rot of the roots is the presence of dark, necrotic areas spreading from the collar along the cambium usually to about 10–20 cm. above soil level, but sometimes rising to a metre above the collar. If there is no discoloration of the cambium above ground, the bark should be cut away towards the collar.

CHRISTOFF (A.). Склеротинията по Черницата. [*Sclerotinia* parasitic on the Mulberry.]—*Renseignements Agricoles*, Sofia, xiii, 1–2, pp. 127–139, 3 figs., 1932. [English summary.]

The author states that in 1928 (a year marked by abnormally wet conditions during the spring and summer in Bulgaria) mulberry [*Morus alba*] plantations in low-lying districts along the

river Maritza were severely attacked by a disease which killed a large number of young shoots arising from two-year-old twigs, and reduced the leaf production by 10 to 50 per cent. The causal organism, which was readily isolated from the lesions and the pathogenicity of which was proved by inoculation experiments, was identified from the morphological characters of its ascogenous stage (produced under controlled conditions) as *Sclerotinia sclerotiorum.* Field observations indicated that it gains entry into the host tissues through old leaf scars and the scales of still dormant buds, from which, under favourable conditions of temperature and humidity, it spreads into the sub-cortical tissues of the twigs, rapidly destroying them and forming numerous isolated or aggregated sclerotia. The disease is believed to be of comparatively old standing in the regions surveyed, but it only assumes an epidemic character in years when periods of warm and dry weather frequently alternate with cold and rainy spells. Some local, but as yet unauthenticated, observations would indicate the existence in the mulberry of varietal differences in susceptibility to the disease, which should be easily amenable to control by the excision of all infected twigs and adequate pruning of the trees in order to ensure the free circulation of air and the access of direct sunlight to all parts of the crown.

KANGAS (E.). **Über die Schädigungen der Kiefernpflanzenbestände in Siikakangas.** [On the injuries of the Pine plant stands in Siikakangas.]—*Silva Fennica,* 17, 107 pp., 12 figs., 5 graphs, 1 map, 1931. [Finnish, with German summary.]

Only three fungi were found causing damage to the pine seedling stands of Siikakangas (central Finland) during recent observations, viz., *Cronartium* (*Peridermium*) *pini, Hypodermella sulcigena,* and *Lophodermium pinastri,* the last-named being the most important [*R.A.M.*, viii, p. 687 ; xi, p. 136]. On older plants the fungus occurs in its conidial stage (*Leptostroma pinastri* Desm.) on small branches and twigs. In the younger stands (five years old and upwards) this organism is a most formidable parasite in its *Lophodermium* stage, especially among seedlings 30 to 60 cm. in height grown in densely sown furrows. *Phacidium infestans* [ibid., xi, p. 214] is believed to have been partially responsible for the destruction of large areas of pine seedling stands in the years following the exceptionally hot summer of 1921.

New York blister rust control work breaks record.—*Journ. of Forestry*, xxix, 8, p. 1216, 1931.

According to reports received by H. L. McIntyre, supervisor of forest pest control in the New York Conservation Department, the number of acres of white pine [*Pinus strobus*] forest and plantations covered by the year's campaign for the eradication of *Ribes* against blister rust [*Cronartium ribicola* : *R.A.M.*, xi, p. 142] is 132,000, compared with 107,283 and 127,000 in 1930 and 1929, respectively. Of the new State reforestation areas, 17,135 acres were protected by the year's work, involving the destruction of 420,975 *Ribes* bushes, in addition to which a protective border was established 900 ft. wide in open country and 400 ft. wide in

woodlands adjoining the planted areas. The cost averaged 47 cents per acre for the area protected.

PEARSON (R. S.). **Report of the Director of Forest Products Research for the year 1930.**—*Rept. Forest Products Res. Board for the year 1930*, pp. 5–52, 10 pl., 1 fig., 1 graph, 1932.

In this report it is stated that the moisture content of 25 per cent. specified by the Forest Products Research Laboratory at Princes Risborough in England for timber destined for general carpenters' work is not low enough to render it immune from fungal attack, the minimum content for the development of which is about 20 per cent., but presumes that it will season further soon after being placed in the building. If the timber is to be treated with preservatives it is still necessary to season it to about 20 per cent. moisture content before treatment to obtain satisfactory impregnation.

In further laboratory tests of antiseptics on wood blocks [*R.A.M.*, x, p. 142] *Fomes annosus* proved to be unsuitable, as even when making apparently good growth it did not cause a significant loss in weight. It was decided to employ *Coniophora cerebella* and *Lentinus lepideus* for tests on Scots pine wood blocks and *Polystictus versicolor* on beech blocks.

As an outcome of the conference held at Berlin-Dahlem in June, 1930 [ibid., x, p. 356], the laboratory is participating in a co-operative experiment to arrive at certain standard methods of determining the toxicity of wood preservatives. As a first step an effort is being made to choose one single vigorous strain of *Coniophora cerebella*, to be used in all standard toxicity experiments.

Additional sites for field testing of preservatives [ibid., x, p. 142] have been chosen in North Wales, at an altitude of 900 feet, where the soil is mainly peat, and in Norfolk at an altitude of 100 feet, where the soil is almost pure sand.

In tests of the adaptability of different species of wood to pressure treatment with antiseptics, specimens of standard size (2 in. × 2 in. × 3 ft. 6 in.) were creosoted by a standard process and the figures for absorption used to obtain a measure of the adaptability of the species to treatment. Attempts are being made to eliminate the effect of end-penetration and to measure the rate of penetration of a preservative in a lateral direction radially and tangentially, under a standardized pressure.

The British Wood Preserving Association, formed in 1929 on the lines of the American Wood Preservers' Association, has sought the co-operation of the Forest Products Research Laboratory in the compilation of authentic records of the durability of treated and untreated wood in actual use.

A small experimental house in which the development of a dry rot attack (*Merulius lacrymans*) is to be studied, and control and preventive methods tested, was nearly completed at Princes Risborough during the year.

Investigations showed that the looser and more fibrous types of proprietary wall boards made from vegetable residues are more

susceptible to *M. lacrymans* than the closer, harder, more laminated types.

The collection of type cultures of wood-destroying fungi [ibid., x, p. 142] now includes over 130 species.

The study of *Paxillus panuoides* [ibid., x, p. 143] was completed; the fungus, capable of causing an active brown rot of coniferous timber, frequently occurs in coal mines and occasionally appears in very damp houses. It demands a high moisture content in the wood, but requires a plentiful supply of oxygen; these conditions it finds in sawdust heaps, in which it is commonly present. In diffused light it readily forms fruit bodies in culture on malt agar acidified with malic acid; the amount of light required must be extremely slight, as perfectly developed fruit bodies have been noted in coal mines.

POPHAM (F. J.). **Preservation of Indian timbers—the open tank process.**—*Forest Bull.* 75 (Econ. Ser.), Forest Res. Inst., Dehra Dun, 12 pp., 6 diags., 1931.

The essential features of the open tank process of timber preservation [*R.A.M.*, viii, pp. 212, 621; x, p. 700] are described. For all timber required for external work the preservative recommended consists of 1 part by volume of creosote oil and 1 part by volume of fuel or furnace oil; for special cases in which treated material is required for internal work, sodium fluoride is advised at the rate of 100 lb. in 500 galls. water. Broadly speaking, the cost of the treatment ranges from about 7 annas [approx. 8*d.*] to 1 rupee [1*s.* 6*d.*] per cu. ft., according to the size of the plant, distance from a railway, and other factors. The increased duration of life of the treated timber is roughly about five years. Technical details and sketches are given of various parts of the preservative plant, with a note on the butt treatment of poles.

Among the Indian woods readily treatable by the above process are *Terminalia belerica*, *T. manii*, *T. myriocarpa*, *T. pyrifolia*, *Michelia excelsa*, *Dillenia indica*, and mango (*Mangifera indica*), while some difficulty is experienced in the impregnation of various other species of *Terminalia*, *Dipterocarpus*, *Albizzia lebbek*, *A. lucida*, *A. procera*, *Shorea assamica*, and *Quercus lineata*.

HAASIS (F. W.). **A study of laboratory methods for investigating the relation between moisture content of wood and fungal growth.**—*Phytopath.*, xxii, 1, pp. 71–84, 1932.

In a study on the relation between the moisture content of wood and fungal growth, *Fomes roseus* [*R.A.M.*, x, p. 570] was grown on sapwood of *Pinus ponderosa* at about 27° C. for approximately six months. By adding water to test blocks in a Stender dish [ibid., xi, p. 216], autoclaving them the next day at atmospheric pressure, and allowing them to stand another day, uniform moisture distribution was obtained. It was not found possible, however, to maintain the moisture content at a uniform figure during the period of the investigations, and the results of the tests [which are shown in tabular form] did not give the desired information.

PAPE (H.). **Fäulnis an lagerndem Gemüse und ihre Verhütung.** [Decay of stored vegetables and its prevention.]—*Mitt. Gesellsch. für Vorratsschutz*, viii, 1, pp. 10–11; 2, pp. 21–24, 1 fig., 1932.

Popular notes are given on the decay of stored vegetables, e.g., beets, carrots, parsley roots, celery, and salsify [*Tragopogon porrifolius*], in Germany by *Botrytis cinerea*, *Sclerotinia sclerotiorum*, *Mucor* spp., green mould (*Penicillium* spp.), and other fungi and bacteria, together with directions for its prevention by the proper care of the produce and the provision of suitable storage conditions.

NIELSEN (O.). **Undersøgelser over 'black leg' paa Kaal og tørforraadnelse paa Kaalroer.** [Investigations on blackleg of Cabbage and dry rot of Swedes.]—*Tidsskr. for Planteavl*, xxxviii, 1, pp. 131–154, 8 figs., 1932. [English summary.]

Blackleg of crucifers (*Phoma lingam*) [*R.A.M.*, xi, p. 345] was observed on the island of Amager, Denmark, in 1927, the fungus being isolated nine times from cauliflower and cabbage seed as well as from the growing plants. Cabbage seed was found to contain from 0 to 30 infected seeds per 1,000, over 60 of the 80 samples examined being free from the fungus. Pycnidia of *P. lingam* have often been observed on seed being tested for germination in the Jacobsen germinator. In a consignment of American cabbage seed known to have been infected by blackleg *P. lingam* failed to develop in agar cultures made seven years after harvesting, so that the fungus had evidently died during the interval, though 15 per cent. of the seed germinated.

The seed becomes infected in the siliquae, the dormant mycelium occurring between the seed coat and the embryo in the rudimentary seed albumen. Many seedlings die with the symptoms of 'damping-off', the spores of the fungus spreading from them to neighbouring plants. Later the root becomes black and rots away and the plant collapses. *P. lingam* may cause severe damage among stored winter cabbages.

Dry rot of swedes, also caused by *P. lingam* [ibid., vii, p. 71; viii, p. 752], is disseminated by the seed in the same way as blackleg. The fungus has frequently been found on swede seeds and isolated from them four times. Swede seedlings, like those of cabbage, are liable to damping-off, and from September onwards secondary infection from these seedlings appears in the field. Swede seed has been found to contain from 0 to 31 infected seeds per 1,000; of the 70 swede and 10 turnip seeds samples examined, nearly 25 per cent. showed the presence of *P. lingam*.

The only practicable control measures against *P. lingam* are stated to be seed disinfection (one hour's immersion in 0·5 per cent. uspulun after 30 minutes' pre-soaking) and a rational system of crop rotation to prevent soil infection.

BLANK (L. M.). **The pathogenicity of Fusarium conglutinans Wr. at low soil temperatures.**—*Phytopath.*, xxii, 2, pp. 191–195, 1932.

The minimum soil temperature at which cabbage yellows

(*Fusarium conglutinans*) becomes apparent is usually held to be 17° C. [*R.A.M.*, vi, p. 265], but the writer's experiments under controlled conditions in Wisconsin clearly showed that the disease may develop in cabbage, cauliflower, Brussels sprouts, and other sub-species or varieties of *Brassica oleracea* at 12° to 13°, while at 16·5° the fungus is capable of killing a large proportion of the seedlings. As already shown by Walker and Wellman [ibid., viii, p. 148], the Moss Curled Dwarf is the most susceptible kale [*B. oleracea* var. *acephala*] variety and Siberian the least, the thousand-headed being intermediate.

Honig [F.]. **Beiträge zur Kohlkropffrage.** [Contributions to the problem of finger-and-toe of Cabbage.]—*Nachricht. über Schädlingsbekämpf.*, vii, 1, pp. 22–27, 4 figs., 1932.

Good control of finger-and-toe disease (*Plasmodiophora brassicae*) on mustard [*Brassica alba*] was obtained at Nuremberg, Germany, by the application to the soil of uspulun at the rate of 100, 200, or 300 gm. per sq. m. [*R.A.M.*, ix, p. 752], which reduced the incidence of infection (average of all plots) from 49·6 to 7·2 per cent. The plants in the treated plots were, moreover, only affected at the root tips in contrast to those in the untreated, which were attacked at or near the collar.

Other experiments showed that the White Munich Beer radish may contract up to 20 per cent. finger-and-toe infection [ibid., xi, p. 16]. *Matthiola annua* maintained its immunity from the disease [ibid., ii, p. 223] while some other crucifers were attacked to the extent of 80 per cent. In a test with five varieties of kohlrabi [*B. oleracea* var. *caulo-rapa*], the incidence of infection was as follows: Gelbe Schmalz 7·3 per cent., Weisse Schmalz 27·7, Weisse Wester 0, Gelbe Wester 32·6, and Apfel gelb 6·2. In Germany, therefore, unlike Switzerland [ibid., ix, p. 218], the Schmalz varieties are liable to infection by *P. brassicae*, this being possibly an instance of biologic specialization.

Laubert (R.). **Cystopus-Wurzelkropf an Radieschen.** [*Cystopus* root swelling on Radishes.]—*Die Kranke Pflanze*, ix, 1, pp. 3–4, 1932.

A radish plant of the Eiszapfen [Icicle] variety sent from Aschersleben [Saxony] to the Biologische Reichsanstalt for examination in October, 1931, showed a puffy, fleshy swelling on the upper part of the tap-root, the tissues of which were found to contain the oospores of *Cystopus candidus* [*R.A.M.*, x, p. 556]. This is believed to be only the second record of the occurrence of the fungus in question on a radish root, the first having been made by Beck von Mannagetta (*Lotos*, xlvii, p. 281, 1899), who detected it in association with *Peronospora brassicae* [ibid., xi, p. 220] on a red variety in Czecho-Slovakia.

Tompkins (C. M.) & Pack (D. A.). **Effect of temperature on rate of decay of Sugar Beets by strains of Phoma betae.**—*Journ. Agric. Res.*, xliv, 1, pp. 29–37, 1 fig., 1 graph, 1932.

The purpose of the investigation reported in some detail in this paper was to study the effect of temperature and length of storage

on the rate of development of the rot induced in sugar beets by *Phoma betae*, which is stated to be undoubtedly the most important wound parasite of the stored crop in the western United States [*R.A.M.*, viii, p. 284; x, p. 73]. The experiments included four strains of the fungus which exhibited significant differences in the size of their spores [which are shown in a table] and in their cultural characters; they also differed somewhat widely in the rate at which they destroy beet tissue under controlled conditions, and it is therefore believed that they are distinct strains; there was also evidence of the existence in nature of many more different strains of the organism. The results of the experiments showed that temperature is one of the most important factors involved in the rotting process, the rapidity of which was significantly increased with each increase of 5° C. in temperature from 1° to 15°. The practical inference from these studies is that in localities where high temperatures prevail during the harvest period, the piling up of the beetroots should be delayed until the advent of cooler weather.

MACPHERSON (N. J.). **The cultivation of Lettuce under glass with special reference to varieties resistant to downy mildew.**—*Journ. Min. Agric.*, xxxviii, 10, pp. 998–1003, 6 figs., 1932.

Owing to the very marked susceptibility to downy mildew (*Bremia lactucae*) [*R.A.M.*, iii, p. 248; ix, p. 362], which causes losses amounting sometimes to over 50 per cent. of the crop, of the French Frame Forcing variety of lettuce, which until recently was grown almost exclusively for forcing under glass in the Marton district of Lancashire, varietal resistance tests were carried out under market-garden conditions at two centres in this area. In both localities Loos Tennisball (Gotte à graine blanche de Loos) and Rosy Spring (Rosée printanière) remained unaffected by the disease, while May Queen (Dutch seed), planted at one centre, showed less than 1 per cent. infection, this result being confirmed by a supplementary trial at the horticultural station, Hutton.

Growers of lettuces under glass could do useful work by selecting for stock from which to save seed any plants showing high resistance to *B. lactucae*.

TOWNSEND (G. R.) & NEWHALL (A. G.). **The control of bottom rot of Lettuce.**—*Cornell Agric. Exper. Stat. Bull.* 535, 11 pp., 6 figs., 1932.

Bottom rot of lettuce (*Rhizoctonia* [*Corticium*] *solani*) [the symptoms of which are briefly described: *R.A.M.*, xi, p. 417] causes an annual loss of 30 per cent. of the crop on muck soils in the State of New York. The disease, which is most severe in warm, humid weather, may be very satisfactorily controlled by one application of Du Bay 738 dust (2 per cent. ethyl mercury phosphate) made at the rate of 20 to 25 lb. per acre, suitable traction machines for applying which are described. This treatment, the cost of which did not exceed $15 per acre, gave an average increase in yield of 180 crates of lettuces per acre.

FLACHS (K.). **Durch Sclerotinia minor Jagg. hervorgerufene Salatfäule und Versuche zu ihrer Bekämpfung.** [Lettuce rot caused by *Sclerotinia minor* Jagg. and experiments in its control.]—*Gartenbauwissensch.*, v, p. 541, 1931. [Abs. in *Fortschr. der Landw.*, vii, 8, pp. 233–234, 1932.]

Lettuce in Bavaria is reported to be extensively infected by *Sclerotinia minor* [*R.A.M.*, x, p. 286]. The outer leaves of infected plants first turn brown and rot, the inner leaves then become involved, the root collar decays from the exterior inwards, and finally the whole plant collapses. The minimum, optimum, and maximum temperatures for the growth of the fungus are 5°, 20° to 23°, and 35° C., but viability persists even below –15°. Humidity favours the development of infection, which can take place through the uninjured epidermis. The sclerotia remain viable for more than 20 months. The organism is not transmitted by the seed and is therefore not controllable by seed disinfection, but the application to the soil of 1·5 per cent. formalin or acetic acid at the rate of 10 to 12 l. per sq. m. has given good results, especially in conjunction with the use of peat mould. No remedial effect was produced by various fertilizers, but steam sterilization of the soil is efficacious. Constant attention must be paid to the removal and destruction of wilted plants.

HEIM (R.). **Le Phaeolus manihotis sp. nov., parasite du Manioc à Madagascar, et considérations sur le genre Phaeolus Pat.** [*Phaeolus manihotis* sp. nov. parasitic on Cassava in Madagascar, and observations on the genus *Phaeolus* Pat.]—*Ann. de Cryptog. Exot.*, iv, 3–4, pp. 175–189, 3 pl. (1 col.), 1 fig., 1931.

This is a morphological and biochemical account of a species of *Phaeolus* considered to be new to science and named *P. manihotis*, which was found causing a severe root rot of several cultivated crops, including cassava, pigeon pea (*Cajanus indicus*), bun ochra (*Urena lobata*), and probably also cotton, in several localities of Madagascar. The roots of the hosts are enclosed in a thick, closely adpressed mycelial weft of the fungus, which kills them by asphyxiation; most of the plants attacked soon perish, after which the sporophores are formed above soil level. The latter are usually connate, rusty yellow above, soft, and briefly tomentous. They may be up to 40 cm. in diameter; their general shape is vaguely conical and maximum thickness about 7 cm.; the stipe, which is sometimes wanting, is for the most part 6 or 7 cm. high and 3 or 4 cm. thick. The hymenial pores form an ochraceous or tawny layer and are irregularly rectangular, usually 5 or 6 per 2 mm. surface but in places up to 1·5 mm. in diameter. The spores are oboval-subcylindrical, hyaline, and measure 5·5 to 7 by 3·2 to 4·3 μ; they are borne on short, claviform basidia, 11 to 14 by 6 to 8 μ, each provided with 4 sterigmata.

PASSECKER (F.). **Schädliche Pilze in Champignonkulturen.** [Injurious fungi in Mushroom cultures.]—*Obst- und Gemüsebau*, lxxviii, 2, pp. 26–27, 3 figs., 1932.

Popular notes are given on the diseases of cultivated mushrooms

in Austria and elsewhere caused by *Hypomyces perniciosus* [*Mycogone perniciosa*] ('môle'), which is stated to be so widespread in France that scarcely a bed is free from it [*R.A.M.*, vi, p. 530 : x, p. 8]: *Myceliophthora lutea* [ibid., vi, p. 523] and species of *Aspergillus*, *Penicillium*, and *Trichoderma*, responsible for green, yellowish-green, or bluish-green patches ('verdigris') in beds where the manure is insufficiently fermented; *Monilia fimicola* ('plaster-of-Paris disease') [or *Verticilliopsis infestans*: ibid., v, p. 592; viii, p. 288]; *Clitocybe dealbata* [*C. candicans*] and *Pleurotus mutilus* ('cat's ear') [ibid., v, p. 592], both of which are generally introduced with the spawn or soil. Directions are given for the control of the diseases, e.g., by disinfection of the beds with 2 to 2·5 per cent. lysol or with a solution of potassium permanganate.

NIELSEN (O.). **Champignon-sygdomme.** [Mushroom diseases.]—Reprinted from *Gartnertidende, 1932,* 2 pp., 1932.

Notes are given on the occurrence and control of a number of diseases affecting cultivated mushrooms in Denmark and other countries [see preceding abstract].

'Bubbles' or 'môle' (*Mycogone perniciosa*), first described from Paris in 1888, is stated to be responsible for the heaviest losses in the mushroom beds of France, England, and the United States (10 to 25 per cent. of the yield in the Paris district); of recent years the parasite has been detected several times in Denmark. *Myceliophthora lutea* completely prevents the development of the cap and destroys the entire bed. Other diseases are caused by *Monilia fimicola*, *Verticilliopsis infestans*, *Clitocybe candicans*, *Pleurotus mutilus*, *Pseudobalsamia* [*microspora*: *R.A.M.*, x, p. 290] (causing the loss of the later part of the crop), and *Pseudomonas tolaasii* [ibid., iv, p. 469]. Some of these do not attack the mushrooms themselves, but interfere with their development in the beds.

Lambert's studies on the temperature relations of *Mycogone perniciosa* are briefly summarized [ibid., ix, p. 429]. The fungus may be killed by the application to the soil of 2 per cent. lysol, formalin, or phenol, or 0·2 per cent. corrosive sublimate, but the latest recommendation from the United States is to keep both the manure and the covering soil at 50° C. in a house which should be fumigated with sulphur at the rate of 4 gm. per cu. m. Should the fungus be found to have entered the house despite all precautions, the soil should be treated with one of the above-mentioned disinfectants and the temperature maintained at 10° to 13°. When the moisture content of the manure is 50 to 60 per cent. the mushrooms produce rhizomorphs in profusion, but above 72 per cent. growth ceases. In order to ensure the best development of the mushrooms the soil reaction should be adjusted to about P_H 6.

SMALL (T.). **Report of the Mycologist.**—*Rapports aux États de l'Île de Jersey pour l'année 1931*, pp. 28–40, 3 pl., 1932.

Experiments conducted in Jersey [Channel Islands] in 1931 indicated that potato blight (*Phytophthora infestans*) was not

reduced when the seed was treated with copper and sulphur dusts, immersed for two hours when the sprouts were present in December in 1 pint of 40 per cent. formaldehyde per 30 galls. water, or immersed for $1\frac{1}{2}$ hours in December in mercuric chloride 1 in 1,200. Spraying the soil with 3 galls. of 40 per cent. formaldehyde in 100 galls. water per perch also had no effect on the disease but increased the yield. When the plants were sprayed during the growing season with copper sulphate and caustic soda (6–2–60) they remained healthy, tubers from the sprayed plants being free from blight when dug up and remaining healthy when stored; unsprayed plants were severely blighted, the disease being prevalent in the tubers at digging time and later. Cutting and removing the tops and spraying the soil with 2 per cent. formaldehyde just before harvesting appeared to be unnecessary if the plants were healthy when dug, and where the plants were already diseased did not prevent tuber infection.

The fungus was also prevalent on outdoor tomatoes, while a few glasshouse tomato crops were also attacked. Attempts artificially to infect tomatoes with inoculum from diseased potato plants were unsuccessful. Stem canker (*Didymella lycopersici*) caused much loss of fruit on outdoor tomatoes.

In another section of these reports (pp. 41–48) it is stated that in a test for the control of scab [*Venturia pirina*] in which Doyenné du Comice pear trees were given, respectively, three applications of sulfinette, four of kolodust, and three of Bordeaux mixture, the first-named treatment resulted in 57·4 per cent. of pears completely free from scab and 42·6 per cent. slightly scabbed, the second in 65·1 per cent. completely scab free, 31·9 per cent. slightly scabbed, and 3 per cent. unmarketable, and the third in 76·5 per cent. clean, and 23·5 per cent. slightly scabbed; the unsprayed control plot gave 13·1 per cent. clean pears, 40·8 per cent. slightly scabbed, and 46·1 per cent. unmarketable. The pears from the dusted plot were very badly russeted. A second experiment with pear trees of the same variety indicated that an extra pre-blossom application of Bordeaux mixture made in the 'mouse-ear' stage gave no greater control than resulted when only one pre-blossom application was made. This result was confirmed in a further test on Pitmaston Duchess pears; in this case, the pears from trees sprayed with Bordeaux mixture had a better finish than those from trees treated with lime-sulphur, the latter showing appreciable russeting.

Müller (K.). **XI. Jahresbericht des Badischen Weinbauinstituts in Freiburg i. Br. Staatliche Versuchs- und Forschungsanstalt für Weinbau und Weinbehandlung mit angegliederter Hauptstelle für Pflanzenschutz in Baden für das Jahr 1931.** [Eleventh report for the year 1931 of the Baden Viticultural Institute at Freiburg i. Br. State Experimental and Research Institute for Viticulture and Œnology with the affiliated Headquarters for Plant Protection in Baden.]—47 pp., 1932.

The following references of phytopathological interest, amongst others, occur in this report. *Peronospora* [*Plasmopara viticola*]

was first observed in the vineyards of the Institute on 3rd June, severe outbreaks occurring on 12th July, followed by general spread of the disease consequent on the persistent wet weather. Petiole [or grey] rot (*Botrytis*) [*cinerea*: *R.A.M.*, vii, pp. 9, 221] was very prevalent, especially on the Müller-Thürgau selection of Riesling × Silvaner. The must weight of the vines in an infected plot amounted to only 62° Oechsle and the acid content 13 per mille.

Notes are given on the prevalence of the more important diseases of various other crops in the region.

MONTEMARTINI (L.). **L'osservatorio fitopatologico di Palermo negli anni 1929–1931.** [The phytopathological observatory of Palermo in the years 1929–1931.]—*Riv. Pat. Veg.*, xxi, 9–10, pp. 257–279, 1931.

This report of plant diseases observed in the vicinity of Palermo during the period under review, contains numerous items of phytopathological interest, some of the more important of which have already been noticed from other sources [cf. ibid., ix, p. 648; x, p. 386; xi, p. 116].

NEUWEILER (E.). **Bericht über die Tätigkeit der Eidgenössischen landwirtschaftlichen Versuchsanstalt Oerlikon für das Jahr 1930. IV. Pflanzenschutz. (1. Januar 1929 bis 31. Dezember 1930.)** [Report on the work of the Federal Agricultural Experiment Station Oerlikon for the year 1930. IV. Plant Protection. (1st January, 1929 to 31st December, 1930.)]—*Landw. Jahrb. der Schweiz,* xlvi, 1, pp. 128–135, 1932.

Wart disease (*Synchytrium endobioticum*) was detected in various localities in Lucerne, St. Gall, Thurgau, and the Vorarlberg frontier region during 1929 and 1930. At Root (Lucerne) potatoes were inadvertently planted on ground that had been infested in 1925 and subsequently sold and broken up for pasturage, with the result that the disease reappeared though four years had elapsed.

Foot rot of cereals (*Ophiobolus herpotrichus*) [*R.A.M.*, vi, p. 429] was very prevalent in 1930, and heart rot of beets [ibid., ix, p. 757] was widespread in both years.

CONNERS (I. L.). **Eleventh Annual Report of the Canadian Plant Disease Survey 1931.**—*Canada Dept. of Agric., Exper. Farms Branch,* 129 pp., 1 map, 1932. [Mimeographed.]

Notes are given on the occurrence of fungous, bacterial, and non-parasitic diseases on cereals, fodder crops, potatoes, and other vegetables, fruit, forest and shade trees, tobacco, and ornamental plants in Canada during 1931 [cf. *R.A.M.*, xi, p. 96].

ORIAN (G.). **Botanical Division.**—*Ann. Rept. Mauritius Dept. of Agric. for the year 1930*, pp. 10–13, 1932.

In this report (cf. *R.A.M.*, x, p. 503) it is stated that leaf scald (*Bacterium albilineans*) and gummosis (*Bact. vascularum*) continue to be the principal diseases of sugar-cane in Mauritius, the

percentages of apparent infection being, respectively, 8 and 8·8 per cent. Streak [ibid., x, p. 504] remained confined to the R.P. variety, and very small percentages of infection were noted during the period under review on four new estates; the yield from diseased rows in an experimental plot laid down in 1928 was 47 per cent. less than that from the healthy rows, as compared with 44 per cent. less in 1929. Fortunately, there appears to be no insect vector of the disease in the island.

The collar rot of tobacco previously described as associated with a *Phytophthora* [loc. cit.] was reported from four districts; in some plantations in one locality spread was very rapid, with resultant severe losses.

A *Fusarium*, considered to be possibly a strain of *F. cubense*, was isolated from the banana wilt reported earlier [loc. cit.]. There was no record of the disease in 1930.

Department of Botany.—*Ann. Rept. Massachusetts Agric. Exper. Stat. for the fiscal year ending Nov. 30, 1931* (*Bull.* 280), pp. 201–208, 1932.

In the section of this report dealing with plant pathology W. L. Doran states that tobacco yields were consistently increased when sulphur was applied to soil infested with *Thielavia basicola* [*R.A.M.*, x, p. 762] whenever the P_H value of the soil was reduced to below 5·9, but not otherwise; sulphur alone reduced the P_H value as much as when aluminium phosphate was added. No consistent relation was established between the severity of the brown root rot of tobacco [ibid., x, p. 763] and the P_H value of soils, soil content of organic and volatile matter, total nitrogen, nitrate nitrogen, or iron and aluminium oxides soluble in water.

No positive evidence was obtained that the causal organism of downy mildew of cucumbers (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) ever lives through the winter in Massachusetts. No oospores or other overwintering stages could be found in green leaves or leaves killed by the disease and wintered in the soil outdoors.

Damping-off [plants and parasites unspecified] was prevented without injury to germination and with benefit to growth by soil treatment with acetic acid 1·2 per cent., applied 10 days before seeding at the rate of 2 qts. per sq. ft., the cost per unit area of soil being only three-fourths that of formaldehyde treatment [cf. ibid., x, p. 161]. The condition was also prevented without injury to germination by vinegar 1 part in 2·5 parts water, applied at the same rate 10 days before seeding. Red pine [*Pinus resinosa*] seedlings were protected against damping-off and germination was not injured by acetic acid 0·8 per cent. applied to the soil at seeding at the rate of 0·75 qt. per sq. ft.

E. F. Guba states that seed from strawberry plants affected with 'gold' disease produced both diseased and healthy seedlings, indicating some seed transmission of the disease. Affected seedlings showed marked stunting and necrosis. Experiments demonstrated that all the vegetative progeny of 'gold' plants acquire the disease, as did many apparently healthy plants obtained from a source where the condition was present. Apart from the systemic

nature of the disease, no evidence of its manner of spread was obtained.

'Stunt' or 'die-out' of strawberries, suspected to be due to the virus of the true yellows disease [ibid., vii, p. 650; see also ibid., ix, p. 193] was observed (for the first time in Massachusetts) on the Marshall variety only.

A study of the reaction of numerous tomato varieties to *Cladosporium fulvum* [ibid., x, pp. 479, 630, 631] showed some differences in susceptibility.

The optimum temperature for the growth of the carnation blight organism (*Alternaria dianthi*) [ibid., x, p. 438] in pure culture was approximately 80° F., the minimum and maximum temperatures being approximately 39° and 97°, respectively. Potassium permanganate 1 in 1,000 was a valuable disinfectant for carnation cuttings, a five-minute dip greatly improving rooting and reducing *Alternaria* infection. Further tests confirmed the efficacy of naphthalene fumigation in controlling *A. dianthi* and *Fusarium* stem rot [cf. ibid., iii, p. 493; viii, p. 787] and gave an increased yield of 35·1 per cent. as compared with syringing with water. The best field treatments (in descending order of merit) were Bordeaux mixture 4-4-50 plus 1 lb. calcium arsenate, the same plus one half-pint fish oil, and Bordeaux mixture 4-4-50 with fish oil.

Department of Botany.—*Forty-fourth Ann. Rept. Pennsylvania Agric. Exper. Stat. for the fiscal year ending June 30, 1931* (*Bull.* 266), pp. 16-19, 1 fig., 1931.

When the fruits of William pears and Yellow Transparent apples, and the twigs of a resistant pear seedling were inoculated with the fireblight organism [*Bacillus amylovorus*], the tissues of the apples were rapidly invaded by the zoogloeal masses, but no invasion was observed in the William pears or the seedling twigs. About six years previously one Kieffer seedling did not blight when inoculated, and since then has remained unaffected although inoculated annually. The seedling was propagated, and cross-pollinations with several commercial varieties made [cf. *R.A.M.*, x, p. 84].

Soil applications of calomel [mercurous chloride] injured tobacco seedlings in containers that prevented leaching, but Bordeaux mixture caused no significant injury and increased the stand. In outdoor beds both fungicides were safely used. On unsterilized soil improvement resulted from applications of calomel made at the rate of 1 gm. per sq. yd., this treatment controlling the injurious soil fungi. Effective control of wildfire [*Bacterium tabacum*] by these treatments depended greatly upon their being applied early, before any seedling spotting developed.

In spite of extreme drought, wood-decaying fungi established themselves on 95·7 per cent. of the stumps of 115 felled oaks, virtually all of which became infected during the first year after felling. The fungi present were *Lenzites betulina*, *Panus stipticus*, *Polyporus* [*Polystictus*] *versicolor*, *Hydnum ochraceum*, *Stereum rameale*, *Panus rudis*, and *S. gausapatum* on 78·2, 45, 36·5, 13·9, 10·4, 6·9, and 2·6 per cent. of the stumps, respectively.

Botany and plant pathology section.—*Ann. Rept. Iowa Agric. Exper. Stat. for the year ending June 30, 1931*, pp. 39–51, 2 figs., 1931.

Surveys conducted during the period under review showed that there is an increase in the amount of maize smut (*Ustilago zeae*) present in Iowa during a dry season. It was also ascertained that *Diplodia zeae* can attack the roots and basal portions of maize through the soil [*R.A.M.*, xi, p. 447], some 13 per cent. of the stand near Ames showing this type of infection in 1930. Greenhouse tests showed that when infection extended 2 to 4 inches above soil level, the stalk died prematurely. Symptoms on the crowns also arose from infected seed which produced plants strong enough to escape seedling blight. Of these two types of infection, the latter was the more serious, probably because the fungus was growing with the plant from the day the seed sprouted until the plant died. *D. zeae* requires very favourable conditions before it can grow in the soil, and judging from the slow progress of the disease the root system of maize appears to be highly resistant to infection from the soil.

Treatments with commercial and experimental dust fungicides on maize seed nearly disease-free, infected with *D. zeae*, and infected with *Basisporium gallarum* [*Nigrospora sphaerica*: ibid., xi, p. 448] increased the field stands, on an average, by 5·8, 26, and 19·9 per cent., respectively, while the average increase in yield was 9·5 per cent.

Twenty-eight physiologic forms of crown rust of oats [*Puccinia lolii*: ibid., xi, p. 233] were identified among 331 collections by the specific reaction of 11 differential oat varieties. Physiologic forms 1 and 7 hibernate in southern oat-growing areas, these, with form 3, which is disseminated from *Rhamnus cathartica*, being the most widespread and prevalent forms in Iowa. Many rare forms were collected only from *Rhamnus*. Physiologic form 1, the most common, attacks all commercial varieties of oats, except Victoria (C.I. No. 2401) and Scasso (C.I. No. 2764), both of which were introduced from the Argentine. Resistance to physiologic forms 1, 2, 3, and 7 of *P. lolii* in the seedling and adult stages is generally dominant and in the seedling stage is dependent upon a single pair of factors. From certain hybrids with Victoria (C.I. No. 2401) as one parent, segregates were selected that appeared to be resistant to crown rust, stem rust [*P. graminis*], and loose and covered smuts [*Ustilago avenae* and *U. kolleri*].

Ninety-seven progenies of the beets selected in 1928 from Pioneer and Leaf Spot Resistant as resistant to *Cercospora* [*beticola*] were grown under epidemic conditions, some 1,500 stecklings being selected for seed production in the field. Remnant seed progenies from this material were grown under epidemic conditions during the winter of 1930. Twelve progenies showed some resistance and were selected for a further field trial. During the summer of 1931, initial infection occurred along the edge of the fields, indicating the presence of weed hosts, and heavy infection with a *Cercospora* was in fact noted on *Chenopodium album*, *Melilotus alba*, lucerne, and clover. Field data indicated the possibility that the leaf spots on these hosts were inter-transmissible.

Plant pathology at the Idaho Station.—*Idaho Agric. Exper. Stat. Bull.* 179, pp. 12, 34, 35, 1931. [Abs. in *Exper. Stat. Record*, lxvi, 3, p. 235, 1932.]

Iron and manganese inserted directly into the trunks of trees were not lastingly effective in preventing chlorosis [*R.A.M.*, ix, p. 501], which was particularly severe in Idaho in the spring of 1930, and was accompanied by considerable visible nitrogen starvation. Greenhouse studies with spinach showed that the P_H value of the sap was not controlled by that of the soil. In investigations into the sclerotium disease of wheat [*Sclerotium rhizodes*: ibid., x, p. 191] two organisms were isolated which differed markedly in the size of the sclerotia produced in pure culture and in the temperature optima for their production. Three distinct physiologic forms of stinking smut [*Tilletia foetens*] were found. Progress was made in the development of Great Northern beans [*Phaseolus vulgaris*] resistant to mosaic [cf. ibid., x, pp. 164, 283, 358], certain selections being of excellent quality and high yield. As segregation is still taking place in these lines, no homozygous resistant segregants have yet been secured. Some variation in susceptibility to clover mildew [*Erysiphe polygoni*: ibid., x, p. 388] was seen in selected and crossed lines, and in preliminary tests some indication was obtained that strains of lucerne resistant to bacterial wilt [*Aplanobacter insidiosum*: ibid., x, pp. 439, 464, 525] may also be secured by selection.

THOMAS (J. A.). **Production de tumeurs d'apparence sarcomateuse chez l'annélide Nereis diversicolor O.F.M. par l'inoculation de Bacterium tumefaciens Sm.** [The production of tumours of sarcomatous aspect in the annelid *Nereis diversicolor* O.F.M. by inoculation with *Bacterium tumefaciens* Sm.]—*Comptes rendus Acad. Sci.*, cxciii, 21, pp. 1045–1047, 1931.

As previously reported in *Sipunculus nudus* [*R.A.M.*, xi, p. 227], individuals of the annelid *Nereis diversicolor* inoculated in the general cavity with *Bacterium tumefaciens* rapidly succumbed to the resultant sarcomatous tumours. In the nucleus and cytoplasm the parasite is transformed into grains near the limit of visibility, while the blood stream is occupied by active rod-shaped elements.

MARCHIONATTO (J. B.). **La roya amarilla del Trigo en la zona central.** [The yellow rust of Wheat in the central zone.]—*Bol. Min. Agric. Nac.*, Buenos Aires, xxx, 4, pp. 215–218, 1931.

As in Europe, the United States, and other cereal-growing countries, yellow rust of wheat (*Puccinia glumarum*) is the first to appear in the Argentine [*R.A.M.*, xi, p. 359], followed by orange (*P. triticina*) and then by black rust [*P. graminis*]. Among the grass hosts of *P. glumarum* are *Bromus unioloides* and *Hordeum jubatum*, whence infection readily spreads to the cultivated wheats, most of which are susceptible, Record and Barleta being the most and Ardito and Favorito the least so. During 1930 there was a constant succession of abnormally cold periods, to which the violent outbreaks of yellow rust in the south of Santa Fé, the central region and south of Cordoba, and the north-east of Buenos

Aires may be attributed. Some general recommendations for the control of the disease are made.

BRIGGS (F. N.). **Inheritance of resistance to bunt, Tilletia tritici, in crosses of White Federation with Turkey Wheats.** —*Journ. Agric. Res.*, xliv, 2, pp. 121–126, 1 graph, 1932.

As a result of his continued studies on the inheritance in wheat of resistance to bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, x, p. 648], the author states that the behaviour of the F_1, F_2, and F_3 generations of crosses between the susceptible White Federation and two resistant strains of Turkey wheat (C.I. 1558 and C.I. 3055) indicated that each of these strains differs from White Federation in one main factor for resistance. These factors are similar in effect to each other and resemble the second Hussar factor [loc. cit.] in that about one-half of the heterozygous plants were susceptible, a fact which clearly distinguishes them from the factor for resistance in Martin, which is completely dominant. This conclusion was further confirmed by the presence of bunt in the F_2 population of crosses between the two Turkey strains and Martin, and also by the presence of susceptible and segregating F_3 lines of the same crosses. Further work is in progress to determine whether or not the factors for resistance in the Turkey strains are identical with each other and with the second Hussar factor.

DILLON WESTON (W. A. R.). **The relative resistance of some Wheat varieties to Tilletia caries (DC.) Tul. (= T. tritici (Bjerk.) Wint.).**—*Ann. of Appl. Biol.*, xix, 1, pp. 35–54, 1932.

This paper is a summarized account of the author's investigation at Cambridge, started in 1923, of the relative resistance of wheat varieties to bunt (*Tilletia caries*) in England, some results of which have been from time to time noticed in this *Review* [*R.A.M.*, ix, p. 27; x, p. 444, *et passim*]. The data obtained [presented in tabular form] indicated that the relative susceptibility of a wheat variety is considerably influenced by environmental conditions, e. g., date and rate of sowing, by the spore load of the seed-grain, and also by the origin of the inoculum used, the strain naturally occurring or grown for several consecutive seasons on a given variety being much more virulent to it than strains derived from other varieties. This last point was well illustrated in wheat hybridization experiments between resistant and susceptible varieties, in which the F_3 progeny of crosses was tested by infecting the seed-grain with bunt from both parents and with 'mixed F_2 bunt', i.e., from a large bunch of bunted ears from all the affected F_2 plants derived from inoculation with the various parental bunts; F_3 plants free from bunt were obtained only in the few cases in which one parental bunt happened to be unobtainable for seed infection. Contamination of the soil with spores of *T. caries* was shown to have a minor significance under English conditions, and may be ignored in varietal tests for resistance.

These results are interpreted to indicate that *T. caries* consists of a number of physiological forms [cf. ibid., xi, p. 360]; repeated passage of the parasite through a given variety is believed to increase its virulence because this process leads to the selection of

a particular form or forms well adapted to the environmental conditions provided by the variety. It is thought that varietal resistance of wheat to *T. caries* is dependent on at least three factors, namely, the strain of the host, the physiological form of the parasite, and environment.

Experiments in 1928–9 and 1929–30 confirmed the susceptibility of rye to *T. caries* from wheat [ibid., x, p. 590], and indicated that it may be used as a differential host for determining the different physiological forms of wheat bunt.

Bodnár (J.) & Terényi (A.). **Biochemie der Brandkrankheiten der Getreidearten. IV. Mitteilung. Wirkungsmechanismus der Quecksilbersalze auf die Weizensteinbrandsporen [Tilletia tritici (Bjerk.) Winter].** [Biochemistry of the smut diseases of cereals. Note IV. The mechanism of the action of mercury salts on the spores of Wheat bunt (*Tilletia tritici* (Bjerk.) Winter).]—*Hoppe-Seyler's Zeitschr. für Physiol. Chemie*, ccvii, 1–2, pp. 78–92, 1932.

The results [which are fully discussed and tabulated] of the writers' investigations at Budapest on the mechanism of the action of mercury salts on wheat bunt (*Tilletia tritici*) [*T. caries*] spores [cf. *R.A.M.*, ix, p. 444] showed that the spores adsorb from 0·01, 0·05, and 0·1 per cent. mercuric chloride, mercuric bromide, and mercuric acetate solutions a considerable amount of mercury (e.g., from 0·1 per cent. solutions 3·65, 2·58, and 10·15 per cent. mercury, respectively: see also *Zeitschr. Physiol. Chem.*, cxcii, p. 274, 1930). The adsorption of mercury is irreversible.

The bunt spores containing adsorbed mercury do not germinate on a calcium nitrate solution, whereas those steeped in mercuric cyanide and containing no adsorbed mercury germinate well. On damp soil the bunt spores treated with mercuric chloride and mercuric bromide solutions do not germinate, while those treated with mercuric acetate germinate well notwithstanding their high content of adsorbed mercury.

In addition to the mercury ions the bunt spores adsorb from the mercuric chloride and mercuric bromide solutions mercuric chloride and mercuric bromide molecules, which with their lipoid-soluble properties penetrate and kill the spores. The spore-destroying action of a dilute (0·005 per cent.) mercuric bromide solution—in contrast to the ineffective mercuric chloride at the same strength—may also be attributed to the mercuric bromide content, 0·4 per cent. being the minimum amount that kills the spores on adsorption. The bunt spores can only adsorb mercury ions from a mercuric acetate solution (the acetate ion cannot be adsorbed), and as the former are insoluble in lipoids they cannot penetrate and kill the spores but merely prevent their germination on a calcium nitrate solution; on soil the moisture dissolves the mercury. Thus the mechanism of action of the mercury ion agrees with that of the copper ion, but more of the former is necessary to prevent spore germination (3·5 per cent.) than of the latter (0·5 per cent.).

Sodium chloride reduces the action of mercuric chloride on the bunt spores by its effect in diminishing the mercuric chloride concentration. The spores treated with a sodium chloride-containing

solution of mercuric acetate do not germinate on damp soil, since the mercuric chloride molecules arising from the reciprocal action of the chloride and mercury ions destroy the spores.

BRESSMAN (E. N.). **Effect of bunt on height of Wheat plants.**—*Phytopath.*, xxii, 3, pp. 259–262, 1932.

The results [which are tabulated and briefly discussed] of a survey conducted in Oregon in 1928 of the relative height of wheat plants of ten varieties inoculated with 43 collections of bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] showed that, in general, *T. foetens* (commonly known as 'high smut') produces a taller infected plant than *T. caries* ('low smut'). These differences, however, are not constant characters of the species, the height of the diseased plants also being influenced by varietal peculiarities and environmental conditions.

BONNE (C.). **Ergebnisse mit dem Kurzbeizverfahren in der Praxis.** [Results with the short disinfection process in practice.]—*Fortschr. der Landw.*, vii, 6, pp. 161–163, 2 figs., 1932.

Full details are given of the Germator (Miag, Braunschweig) apparatus for continuous seed-grain disinfection by the short disinfection process [*R.A.M.*, x, p. 445 ; xi, p. 36, *et passim*]. The treating capacity of the machine is 34 cwt. per hour (wheat and rye). Wheat bunt [*Tilletia caries* and *T. foetens*] was completely controlled with germisan in the above-mentioned apparatus, and even after months of storage the seed-grain with a moisture content of 18 per cent. showed no reduction of germinability nor any moulding [cf. ibid., x, p. 90].

WINKELMANN (A.). **Untersuchungen über die Haftfähigkeit von Trockenbeizmitteln.** [Investigations on the adhesive capacity of dusts.]—*Angew. Chemie*, xlv, 12, pp. 238–241, 1932.

The results [which are fully discussed and tabulated] of the writer's continued investigations on the adhesive capacity of dry seed-grain disinfectants [*R.A.M.*, x, p. 650] showed that this property is not influenced in any particular direction by the 'thousand grain weight' or moisture content of the cereal. It was further found that the use of different cereals does not affect the adhesive capacity of dusts to the extent that is generally assumed, so that it is quite in order to draw conclusions from tests with one cereal as to the probable degree of adhesion of the dust on seed-grain of other kinds. Such trials need not be conducted in special steeping machines ; small samples of the seed-grain and dust may be rotated in flasks (e.g., in the Wagner electric apparatus) at a velocity of 40 to 42 revolutions per minute. It is advisable to use three varieties of the cereal in order to exclude irregularities due to a special constitution of the seed.

In order to determine the efficacy of dusts in continuously working apparatus, the degree of adhesiveness should be tested on samples disinfected in flasks for ½, 1, 2, and 3 minutes. Copper carbonate was found to be unsuitable for use in continuous dusting machines owing to its tendency to conglomeration on wheat seed-

grain infected by *Tilletia tritici* [*T. caries*] and poor adhesive capacity. Generally speaking, the results of laboratory tests with samples of dusts used against wheat bunt may safely be applied in practice, especially since, in the case of some of the [unnamed] preparations tested by the writer, the dust adheres better to infected than to non-infected seed-grain [cf. ibid., xi, p. 442].

FOËX (E.) & ROSELLA (E.). **Recherches sur le piétin du Blé au cours de la campagne 1930–1931.** [Studies on the foot rot of wheat during the season 1930–1931.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 9, pp. 376–383, 1932.

Continuing their studies on foot rot of wheat in France during 1930–1 [*R.A.M.*, xi, p. 361], the writers again observed the virulent parasitism of *Cercosporella herpotrichoides*, especially on October sowings. This organism is responsible both for lodging and for a blight that often destroys the seedlings. *Ophiobolus graminis*, which was widely disseminated in the fields during the period under review, caused only slight and temporary injury to the plants in the writers' outdoor inoculation tests, but at a higher temperature (15° to 28° C.) under glass it seriously damaged the roots and coleoptiles. *O. herpotrichus* attacked 9 to 33 per cent. of the plants in the outdoor plots from March to May, the stem bases being considerably involved and lodging sometimes following. Under glass the plants were also infected by *O. herpotrichus*, but little damage ensued. *Leptosphaeria herpotrichoides* and *Wojnowicia graminis* also infected both the field and greenhouse plants.

HYNES (H. J.). **Foot rot of cereals. Observations on the disease in New South Wales.**—*Agric. Gaz. New South Wales*, xliii, 2, pp. 107–115, 1 fig., 1932.

The author states that his extensive investigations have shown that of the three major fungal diseases (*Helminthosporium sativum*, *Ophiobolus graminis*, and *Fusarium* sp.) [cf. *R.A.M.*, xi, pp. 291–294] which attack the roots and crowns of cereals, the foot rot caused by *H. sativum* is economically the most important in New South Wales, especially on wheat, the losses in which are due both to a seedling blight leading to impoverishment of stand and to a reduced yield in grain. In 1929, in particular, the disease attained epidemic proportions on wheat and oats in some parts of the State. Although no entirely resistant varieties of cereals are yet known there were indications that in seasons favourable to foot rot late maturing varieties of wheat are sometimes more severely attacked than the early ones, while oats are usually very resistant.

In giving a rather detailed description of the symptoms of the *H. sativum* foot rot on wheat, on which it may develop at any stage in the development of the host, and all the parts of which may be attacked (although usually it does not assume a conspicuous form until the plants are in head), it is stated that diseased plants do not necessarily exhibit a brownish discoloration at the base, although this symptom is usually present; often the attack is confined to the root system alone. The chief distinction between the symptoms of foot rot and take-all (*O. graminis*) in mature plants is the occasional development in the latter disease of perithecia on

the basal sheaths, and the presence of dark grey to blackish-brown, dull or shiny mycelial mats between the innermost sheath and the stem, and of light to dark brown spots or streaks at the base of the straw [cf. ibid., xi, p. 444].

Experiments with numerous isolations of *H. sativum* from various hosts in New South Wales definitely established the existence of several distinct physiological forms of the fungus, which vary in their geographical distribution and in their virulence to wheat and oat seedlings.

All the evidence collected by the author suggested that the development of the disease is largely dependent on conditions that favour the growth of the parasite and have a debilitating effect on the host. The system of feeding off the young cereal crops to cattle, in particular, was shown to predispose them to severe attacks of foot rot, as well as to frost injury. The disease is known to be favoured by high soil temperature and moisture, but local experiments indicated that the latter factor is more important than the former; this view is supported by the fact that wheats sown early in the season, when soil moisture is high, are usually more liable to the disease than later ones. Field and greenhouse experiments also showed that the amount of seedling blight is markedly reduced by increased applications of superphosphate to the soil, or by applying certain fungicidal dusts to the grain prior to sowing.

BENNETT (F. T.). **Fusarium species on British cereals. The Gibbosum group. I. F. scirpi Lamb. et Fautr.**—*Ann. of Appl. Biol.*, xix, 1, pp. 21–34, 1 pl., 2 figs., 1932.

Continuing his studies of species of *Fusarium* associated with cereal diseases in Great Britain [*R.A.M.*, x, p. 783], the author gives a very full morphological and cultural account of *F. scirpi* [ibid., iv, p. 274; x, p. 788], a mycelial form of which he obtained from the basal parts of *Triticum monococcum* and from roots of barley in the eastern counties, and to which he gives the varietal name *pallens* to distinguish it from a second variety isolated from the bases of barley grown at Woburn, to which the varietal name *nigrans* is given. A very detailed description of the differences in the morphology of the mycelial and pseudopionnotal forms of the two varieties and in the pigmentation produced by them in artificial substrata, especially rice and hard oat agar, is given and it is suggested that the inherent instability in the variety *nigrans*, resulting in the production of forms closely resembling the *pallens* type, indicates that it is genetically derived from the latter.

Both varieties were shown to be (with one exception) of similar pathogenicity to cereals, seedling blight due to them only resulting with seed-grain from plants attacked in the ear. Under abnormal conditions, e.g., with infected seed-grain grown in contaminated soil in a warm greenhouse, they attack wheat and barley seedlings severely, and oats to a lesser degree. Under reasonably good conditions for plant growth, however, the seedlings were able to withstand the fungus, and in some cases looked more vigorous than the controls owing to a stimulation of early tillering. These experiments, coupled with field observations, indicate that *F. scirpi*

is of little importance as a cause of seedling blight of cereals under ordinary field conditions. While both varieties are capable of attacking the ears of wheat, barley, and oats at any period between flowering and maturity, experiments showed that var. *pallens* is more virulent on these parts than var. *nigrans*, inasmuch as under conditions of high humidity during and immediately after the blossoming period, it reduced the germinability of the grains from 82 to 70 per cent. for wheat, and from 96 to 52 per cent. for barley. The infected grains, when used for seed, produced less vigorous plants and a reduced yield.

MARCHIONATTO (J. B.). **Las 'fusariosis' del Trigo y del Maiz.** [The 'fusarioses' of Wheat and Maize.]—*Bol. Min. Agric. Nac.*, Buenos Aires, xxx, 3, pp. 189–191, 1931. [Received June, 1932.]

Wheat scab (*Fusarium graminearum*), the symptoms of which are briefly described in popular terms, was first reported from Argentina in 1927 on the 38 M.A. variety (*Mem. Lab. Pat. Veg.*, p. 9, *Arch. Direc. Lab., Min. Agric. Nac.*, 1928), since when it has been observed in various parts of Buenos Aires and Entre Rios. The perfect stage of the fungus (*Gibberella saubinetii*) was collected on wheat in La Plata in 1928. In 1929 *F. graminearum* was also detected on maize shoots and ears.

F. moniliforme has been observed of recent years on maize (yellow and white varieties) in Buenos Aires, Santa Fé, and La Pampa. The symptoms observed in 1930 closely resembled those described by Valleau from the United States (*Kentucky Agric. Exper. Stat. Bull.* 226, 1920). So far it has not been possible to obtain the perfect stage (*G. moniliformis*) in pure culture.

MORWOOD (R. B.). **Report of Barley smut experiments, 1931.**—*Queensland Agric. Journ.*, xxxvii, 2, pp. 134–135, 1932.

The results [presented in tabular form] of experiments in 1931 in the Toowoomba district of Queensland showed that dusting the seed-grain with copper carbonate does not give control of covered smut of barley (*Ustilago hordei*). Of all the other standard seed-grain treatments tested, the best results in the control of this smut were obtained by dipping the grain for ten minutes in a solution of 1 pint commercial formalin in 30 galls. of water, spreading it out to dry, and then storing it in bags subjected to the same treatment before planting. It is pointed out that skinless barley, however, may be usefully treated against the smut with copper carbonate dust.

NEILL (J. C.). **Elimination of smut diseases from the malting-Barley crops of Ellesmere district.**—*New Zealand Journ. of Agric.*, xliv, 2, pp. 106–107, 1932.

Excellent results have been obtained in the control of seed-borne diseases of malting barley by the use of the hot-water treatment in the Ellesmere district of Canterbury, New Zealand [*R.A.M.*, ix, p. 516]. All the crops grown from seed 'direct from treatment' since the inception of the experiment in 1925 have remained free from smut [*Ustilago hordei* and *U. nuda*] and virtually free from

stripe [*Helminthosporium gramineum*]. The 'once removed from treatment' seed (that is, seed harvested from a crop grown from treated seed) also produced clean crops, as great care was taken from the beginning to prevent recontamination in handling. This seed, producing crops high in yield and quality of clean grain, came into general favour, and by 1929 nearly all the barley sown in the district was once or twice removed from the hot-water treatment.

Each year since 1925 surveys of the district showed a steady decrease in the incidence of these diseases. No loose smut [*U. nuda*] has been found since 1928–9. A trace of covered smut [*U. hordei*] was detected in two crops in 1930–1, but none in the 1931–2 season. A mere trace of stripe remained in 21 per cent. of the crops in 1931–2.

As during the 1931–2 season many growers used their own seed, much of which passed through the common travelling threshing mills without special precautions against reinfection, the entire freedom of all the crops from both smuts indicates that these diseases have been eliminated from the district. This result was accompanied by a large increase in yield per acre and a great improvement in the quality of the grain.

The method, thus, consists in gradually replacing infected seed within a definite area by distributing constantly renewed supplies of clean seed selected and bred under skilled supervision. In the present case success was achieved by close co-operation between the Plant Research Station at Palmerston North and the Canterbury Seed Company.

REED (G. M.) & STANTON (T. R.). **Physiologic races of Ustilago levis and U. avenae on Red Oats.**—*Journ. Agric. Res.*, xliv, 2, pp. 147–153, 1 fig., 1932.

The results [presented in tabular form] of the authors' biological investigation of ten collections in 1929 of oat smuts (*Ustilago levis* [*U. kolleri*] and *U. avenae*) indicated the presence in them, besides some of the physiological forms of the fungi previously recorded [*R.A.M.*, ix, p. 372; x, p. 362], of a definite specialized race of *U. kolleri* exhibiting a high degree of virulence to the Fulghum variety of oats, a fact which may be of considerable economic importance in those States where this type of oats is extensively grown. So far no strain of covered smut has been found capable of infecting the Red Rustproof variety.

STOREY (H. H.). **The filtration of the virus of streak disease of Maize.**—*Ann. of Appl. Biol.*, xix, 1, pp. 1–5, 1 fig., 1932.

Experiments in which leafhoppers (*Cicadulina mbila*) were fed through membranes, using a slight modification of Carter's method [*R.A.M.*, viii, p. 82], on the juice extracted from streak diseased maize plants [ibid., ix, p. 765; xi, p. 427] and passed through various filters, showed that at a P_H of about 6 the infective agent of the juice passes through Chamberland Li, Berkefeld V and N filters, and less freely through Chamberland L3, but not through a Seitz E.K. filter disk.

MAZÉ (P.) & MAZÉ (P. J.). **Sur l'infection du Maïs par le charbon (Ustilago maidis).** [On the infection of Maize by smut (*Ustilago maydis*).]—*Comptes rendus Soc. de Biol.*, cix, 10, pp. 825–827, 1932.

The writers claim that certain [unspecified] rare elements are indispensable to the growth of higher plants and give some details of experiments tending to show that maize varieties are more susceptible to the attacks of *Ustilago maydis* [*U. zeae*] in the absence of these elements.

MAZÉ (P.) & MAZÉ (P. J.). **L'inégale résistance des variétés de Zea mais à l'infection du charbon (Ustilago maidis).** [The unequal resistance of varieties of *Zea mays* to infection by smut (*Ustilago maydis*).]—*Comptes rendus Soc. de Biol.*, cix, 12, pp. 1087–1088, 1932.

In connexion with the differences in reaction to smut (*Ustilago maydis*) [*U. zeae*] shown by the six maize varieties used by the writers in their recent fertilizing experiment [see preceding abstract], the theory is advanced that the so-called 'resistant' varieties are those which can rapidly replace any depletion of their organo-mineral reserves. A similar explanation is advanced to account for the rapid recovery of resistant vine hybrids from the incipient infections of *Peronospora* [*Plasmopara*] *viticola* that were observed in the wet season of 1930.

ELLIOTT (CHARLOTTE), WAGNER (F. A.), & MELCHERS (L. E.). **Root, crown, and shoot rot of Milo.**—*Phytopath.*, xxii, 3, pp. 265–267, 1 fig., 1932.

A number of typical milo sorghum varieties, e.g. Custer and Dwarf Yellow, in Texas, Oklahoma, New Mexico, Kansas, and California, have been showing symptoms of root, crown, and shoot rot, including dwarfing, lack of heading, a yellow discoloration of the leaves, and a dark red discoloration of the central root cylinder and of the interior of the crown. In severe cases, the disease may cause complete failure of the crops and is becoming a limiting factor in milo production. Steam or formaldehyde sterilization of the soil of infested fields resulted in completely healthy crops, while preliminary tests have shown that the above-mentioned symptoms may be induced by the addition of diseased soil or roots to the sterilized soil. These and other facts point to the parasitic nature of the disease, which appears to be confined to alkaline soils. A white bacterium and strains of *Fusarium* have been isolated from rotted plants but their pathogenicity has not been demonstrated. Kafirs, feteritas, sorgos, and Fargo Straightneck milo have been found resistant.

CHAUDHURI (H.). **Sclerospora graminicola on Bajra (Pennisetum typhoideum).**—*Phytopath.*, xxii, 3, pp. 241–246, 3 figs., 1932.

Using Hiura's method [*R.A.M.*, x, p. 23], the writer was able to induce germination in the oospores of *Sclerospora graminicola*, the causal organism of 'green-ear' disease of *Pennisetum typhoideum* in India [ibid., x, p. 517]. A small piece of moist filter paper bearing minute quantities of oospore powder was placed on the surface of

a large bit of moistened cotton in the bottom of a Petri dish, and a second similar layer in the lid, the space between the two being about half the height of the dish. The germ-tubes were not as long as those described by Hiura or Evans and Harrer [ibid., x, p. 306], and up to four were produced by one oospore. In the process of germination a portion of the outer coat may be ruptured and the inner coat protrude out as the germ-tube or the outer coat may split into several parts before germ-tubes are formed. The oospores were found to retain their viability for five years; inoculation experiments with these spores gave positive results, indicating that the disease is propagated through the soil.

SMITH (F. E. V.). **Stem end rot of Citrus and its control in the packing house.**—*Journ. Jamaica Agric. Soc.*, xxxvi, 2, pp. 59–64, 1932.

A brief account is given of investigations conducted in Jamaica to ascertain to what extent the processes used in the citrus packing houses were a contributing factor to the development of stem-end rot [*Diplodia natalensis* associated with a *Phomopsis*: *R.A.M.*, xi, p. 365].

Much of the fruit when received from the orchards bears patches of sooty mould [*Capnodium* sp.]; this should be removed by thorough but not prolonged immersion in water, after which the fruit should be rapidly and efficiently dried. Drying by means of warm air reduced the rot on 12,000 grapefruit and 8,000 oranges treated by at least 50 per cent.

Colouring the fruit with excessive doses of ethylene gas also increased infection, the warm (80° to 87° F.), moist atmosphere of the average colouring room providing ideal conditions for the germination of the fungi. Fruit experimentally subjected to various dosages of ethylene invariably developed more stem-end rot than did similar but uncoloured fruit.

A thorough study was made of the effect of removing the fruit buttons as a means of control [cf. ibid., ix, p. 775]. As the conditions prevailing in the colouring rooms tend to promote almost 100 per cent. germination of the stem-end rot fungi it was considered that if such a high rate of germination could be induced, and the portion of the fruit containing the growing fungus removed, this might save the rest of each fruit. Accordingly, this procedure was carried out in combination with other treatments on some 40,000 grapefruit and 30,000 oranges; in every instance debuttoning after colouring reduced infection by at least 50 per cent., and in one experiment, affecting 80 boxes of oranges of a variety which had never shipped satisfactorily, the amount of rot that developed in the debuttoned fruit was only 1 per cent., as compared with 18 and 31 per cent. in the uncoloured and coloured but not debuttoned fruit, respectively. Examinations of Jamaica fruit upon arrival in London showed that whereas coloured and uncoloured fruit which had not been debuttoned carried from 4·5 to 6·5 per cent. rot, the fruit debuttoned after colouring had only four rotten fruits in eight boxes.

The final recommendations are as follows. The fruit should be picked in dry weather and quickly removed to the packing house.

It should then be subjected to two mild doses of ethylene (1 in 6,000), being well ventilated between the applications. The atmosphere in the colouring room must be kept moist. After 36 to 48 hours' exposure to the gas, the buttons should be removed; girls can easily be trained to do this with a small spoon, cheaply and without damaging the fruit. The importance of removing all dead wood from the citrus trees is again emphasized.

VENKATARAYAN (S.). **Phytophthora arecae, parasitic on Areca tops, and a strain of P. palmivora Butl. (P. faberi Maubl.) on a new host, Aleurites fordii.**—*Phytopath.*, xxii, 3, pp. 217–227, 4 figs., 1932.

Phytophthora arecae was isolated during recent investigations from dying *Areca catechu* tops in Mysore. The fungus formed oogonia and oospores measuring up to 32·9 and 28·1 μ in diameter, respectively, in mixed cultures with the heterothallic strain on *Santalum album* [*R.A.M.*, xi, p. 158] but not with that on areca nuts, thereby proving its identity with the latter strain. The sporangial measurements ranged from 26·4 by 22·2 to 62·7 by 39 μ, the average of 80 being 38·5 by 29·5 μ. Chlamydospores measuring 24 to 42 (average 34·3) μ were also formed.

The outer sheaths of diseased tops were found to contain the mycelium and sporangia of the fungus, and hyphae were also detected in the cells. Both the types of infection described by Coleman (*Mysore Dept. Agric. Myc. Ser. Bull.* 2, 1910) were observed, namely, a watery, slightly discoloured appearance at the base of the flower stalks and a rotting of the bases of the outer leaf sheaths, which could be readily pulled out.

In October, 1930, tung-oil (*Aleurites fordii*) seedlings developed water soaked, later brown spots on the leaves, over which the infection gradually spread, causing wilting and eventual defoliation. A species of *Phytophthora* was isolated from diseased material and grown on various standard media. Sporangia measuring 20 by 15 to 54·6 by 32·7 μ (average of 35 measurements, 32 by 23·6 μ) developed readily in sterile distilled water, and large numbers of chlamydospores (15 to 43·8, average 30·9 μ) were formed on quaker oats agar. Oogonia and oospores measuring up to -7·8 and 23·04 μ in diameter, respectively, were formed in mixed cultures of the *Phytophthora* from *A. fordii* and *P. arecae*. The antheridia were all of the amphigynous type. Positive results were given by a preliminary inoculation test with this *Phytophthora*, which is tentatively identified as a strain of *P. palmivora* [cf. ibid., xi, p. 206], on seedlings of *A. fordii* in the laboratory, the fungus being reisolated from the infected leaves.

KLOTZ (L. J.) & FAWCETT (H. S.). **Black scorch of the Date Palm caused by Thielaviopsis paradoxa.**—*Journ. Agric. Res.*, xliv, 2, pp. 155–166, 2 pl., 5 figs., 1932.

This is a morphological and histological account of the disease of the date palm (*Phoenix dactylifera*), a short note on which [in its form attacking the inflorescence of a tree in the Coachella Valley of California] was recently published [*R.A.M.*, x, p. 185],

and which fresh observations have shown to be widely spread in the locality of its first discovery and in Arizona. Conidia typical of the causal organism (*Ceratostomella paradoxa*) were also observed by the authors on preserved specimens of diseased date palm material collected in north Africa. In nature the disease was found attacking all parts of the date palm, with the exception of the roots and stem which, however, were shown in artificial inoculation experiments to be readily susceptible. In giving a detailed description of the lesions on the various organs of the tree, it is stated that the intensity of attack on the inflorescence is largely dependent on weather conditions preceding and during the time of emergence of the spathes, warm, moist, and windy weather probably favouring its distribution and development.

The optimum temperature for the growth of *C. paradoxa* in culture lies between 24° and 37·5° C. The brown spores apparently need a resting period before germination, while the hyaline conidia germinate immediately after formation. Examination of the tissues of a diseased frond petiole showed the fungus growing intracellularly in the tracheae and parenchyma, and intercellularly in the intercellular spaces but not in the middle lamellae.

Up to the present the losses caused by this disease are apparently of minor importance, but the severity of its attack in some cases indicates that it may become serious enough to require control measures, the chief among which should be the removal of all the affected fronds, leaf bases, and inflorescences, and the disinfection and protection of the pruning wounds with some fungicide. Preliminary experiments indicate that copper sprays or dusts, and various other chemicals may be effective.

PARK (M.). **The effects of drought on Coconuts at Puttalam.**—*Trop. Agriculturist*, lxxviii, 1, pp. 11–14, 1 pl., 1932.

A brief account is given of a serious outbreak in the autumn of 1931 of a disease of coco-nut palms in the neighbourhood of Putalam, Ceylon, the symptoms of which corresponded very closely to those of the bronze leaf wilt in Trinidad [*R.A.M.*, vii, p. 717]. Examination of the diseased palms and of their roots failed to disclose the presence of any pathogenic organism. The author was present when the young leaves and cabbage of one of the affected palms broke off at the level of the bud, and immediate investigation showed that the tissue at the point of the break was soft and flaccid but not diseased. All the evidence collected locally pointed to the condition having been brought about by the severe drought which had prevailed in the region during the preceding six months (3·37 inches of rain as against the usual average of 8·12 inches). This view was confirmed by the observation that the disease was worst on poorly cultivated estates and on land which in wet weather becomes waterlogged and swampy. Young palms which were given good cultivation and were growing under the shade of older trees appeared to remain healthy. The author considers that the trouble should be amenable to control by all measures calculated to improve the tilth and the drainage of low-lying land, in order to induce deeper root development and thus to increase the resistance of the palms to conditions of drought.

MAYNE (W. W.). **Physiological specialization of Hemileia vastatrix B. and Br.**—*Nature*, cxxix, 3257, p. 510, 1932.

In the course of recent work at the Mysore Coffee Experiment Station on the reaction of a number of hybrids and selections of *Coffea arabica* to *Hemileia vastatrix* [*R.A.M.*, x, p. 239], indications were obtained of the existence of physiological specialization in this rust.

Inoculation experiments on detached leaves in the laboratory showed that one selection, *S.* 5/30, was completely resistant to spore collections made from the Coorg variety of *C. arabica*, though somewhat susceptible to infection in the field. In subsequent tests, four leaves from a susceptible Coorg tree and four from *S.* 5/30 were inoculated on different sides of the midrib with spore collections from the two hosts. In the Coorg leaves, 21 out of 24 inoculations with the Coorg spore collection were successful, and 17 out of 24 with *S.* 5/30. On *S.* 5/30 leaves, none of the 24 inoculations with Coorg spores was successful, while positive results were obtained in 23 out of 24 with the *S.* 5/30 collection. A number of similar experiments gave identical results. The infections caused by the two spore collections on the Coorg leaves and by the *S.* 5/30 collection on the foliage of the latter variety are stated to be morphologically indistinguishable.

BRYAN (MARY K.). **An atypical lesion on Cotton leaves caused by Bacterium malvacearum.**—*Phytopath.*, xxii, 3, pp. 263–264, 1 fig., 1932.

Cotton leaves collected in North Carolina in 1929 showed large, irregular, pale green or gray, necrotic areas apparently resulting from internal vascular disorganization. Sections through the lesions showed extensive infection of the vascular system, from which was isolated a strain of *Bacterium malvacearum* differing only in a few minor respects from the type species. Inoculations with subcultures from these isolations gave typical angular spot lesions on the leaf blades, petioles, veins, and bolls, as well as the above-mentioned large, pale spots. Parallel inoculations with a freshly isolated strain of *Bact. malvacearum* from typical angular spot gave the ordinary lesions characteristic of this disease but no systemic infection, of which there is, moreover, apparently no previous record [cf. *R.A.M.*, xi, p. 354]. Serious defoliation was reported to result from infection by the new strain of *Bact. malvacearum*.

ABBOTT (E. V.). **A powdery mildew on Cotton from Peru.**—*Mycologia*, xxiv, 1, pp. 4–6, 1 fig., 1932.

This is a very brief account of the powdery mildew of cotton in Peru, the causal fungus of which was identified as *Erysiphe malachrae* Seaver [*R.A.M.*, xi, p. 225] after comparison with the type from Porto Rico. In the cooler and moister valleys both the perithecial and the conidial stages have always been found together on the same plant, but in Piura, where the climate is much hotter and drier, the perfect stage has not been observed, indicating that the

absence of the latter is due to climatic rather than varietal peculiarities. The conidial stage, with elongate elliptical conidia, 35 to 60 by 14 to 30 μ, is believed to be *Ovulariopsis gossypii* [ibid., ix, p. 63] since morphologically it agrees very closely with Miss Wakefield's description [cf. also ibid., ix, p. 715]. The disease is stated to be of minor economic importance, and no control measures are recommended.

It is pointed out that although several powdery mildews were collected in the conidial stage on 47 species of cultivated and wild plants, this is the only *Erysiphe* which was found in Peru. In Porto Rico also this appears to be the only species found in the perfect stage, but it occurred there on a Malvaceous weed [*Malachra capitata*] and not on cotton.

EHRLICH (J.) & WOLF (F. A.). **Areolate mildew of Cotton.**—*Phytopath.*, xxii, 3, pp. 229–240, 4 figs., 1932.

Latin and English diagnoses are given of *Mycosphaerella areola* n.sp., the ascigerous stage of *Ramularia areola* (*Cercosporella gossypii*) [*R.A.M.*, ix, p. 32; x, p. 775], which is a common cause of mildew on cotton (*Gossypium hirsutum, G. barbadense, G. peruvianum,* and *G. vitifolium*) in the south-eastern United States and many other parts of the world.

In addition to the conidial stage, borne on the lower and occasionally also the upper surfaces of the pale to yellowish-green lesions on the leaves and bracts, the authors found spermogonia appearing as black spots on the lesions in November and December. In the early stages they are sclerotium-like bodies, 28 to 75 μ in diameter, composed of compact, thick-walled cells, of which the innermost are the first to become spermatiferous. Each protoplast undergoes separation into a number of rod- or bone-shaped spermatia, after which the cell wall disintegrates and the spermatia are liberated in a matrix consisting of cytoplasm and disintegrating cell walls. The process continues centrifugally until only the outer layers of thick-walled cells remain. With the apical opening of the spermogonium the spermatia, which measure 2·4 to 4 by 0·4 to 2 μ, are exuded in a viscous mass through the ostiolum. The perithecia, which develop sparsely in April on the areas previously occupied by the conidia and spermogonia, are dark brown, with a slight papilla, and measure 70 to 80 μ in diameter. The asci measure 35 to 40 by 6 to 8 μ, and the biseriate, elongated ascospores, slightly constricted at the septum, 12·4 to 15·6 by 3·2 to 3·8 μ.

Considerable difficulty was experienced in obtaining pure cultures of the cotton mildew organism, but a small proportion of the conidia germinated in tap or distilled water to which fragments of cotton leaves or traces of sugar were added. Isolations from ascospores were made by inverting agar plates over decaying leaf fragments on moist blotting-paper in the tops of Petri dishes; on transference to potato-agar slants colonies of the conidial type developed but neither conidia nor spermogonia were formed. Inoculation experiments gave consistently negative results, no doubt primarily due to the absence of suitable moisture conditions, as indicated by the observation that wet seasons are necessary for field infection.

FIKRY (A.). **Investigations on the wilt disease of Egyptian Cotton caused by various species of Fusarium.**—*Ann. of Botany*, xlvi, 181, pp. 29–70, 2 pl., 5 graphs, 1932.

This is a detailed account of the author's investigation (started in 1927) under controlled conditions in London and Cambridge of the fungi associated with the wilt disease of cotton in Egypt [*R.A.M.*, x, p. 379; xi, p. 178]. The examination of diseased material sent in indicated that the trouble is very widely spread throughout Lower Egypt (where the annual reduction in yield due to it is estimated at over 10 per cent.) and is also present in certain localities of Upper Egypt. In cotton seedlings the main symptom of the disease is a brown discoloration of the fibro-vascular bundles of the roots and stems, while the first outward sign of infection which appears under favourable conditions is a characteristic yellowish spotting (termed mosaic) of the cotyledons and leaves.

Inoculations with the various strains of fungi which were isolated from affected plants originating from Lower Egypt and from three localities in Upper Egypt showed them to be highly parasitic on Sakel cotton, but those isolated from cotton plants received from three other localities of Upper Egypt proved to be non-pathogenic. The study of these organisms showed them to belong to the genus *Fusarium*, and three of the pathogenic forms were definitely identified by Wollenweber as *F. orthoceras* (Upper and Lower Egypt), *F. vasinfectum* var. *inodoratum* (Lower Egypt) [ibid., xi, p. 41], and *F. angustum* (Upper Egypt). *F. solani* (Upper Egypt) was not pathogenic. Under controlled conditions the pathogenic forms were capable of severely attacking cotton seedlings at temperatures between 21° and 30° C., a range which includes the optimum for growth of the host; no infection occurred at 33° or 36°, and the minimum soil temperature for infection was about 18°. A soil moisture content of 50 to 60 per cent. appeared to be the most favourable both for the growth of the cotton seedlings and for the intensity of attack and subsequent development of the disease. The highest degree of infection was obtained in English and Egyptian soils of P_H 7·8 to 8·3. The incubation period of *F. orthoceras* in the host was 5 or 6 days at temperatures ranging from 20° to 30°.

Further experiments showed that filtrates of the culture fluids in which *F. orthoceras*, *F. vasinfectum* var. *inodoratum*, and *F. solani* were grown, and extracts from the mycelium of these species, caused wilting of young cotton shoots, including the variety Ashmouni which is resistant to wilt disease. The toxic substance responsible for the wilting is thermostable and non-volatile. It was also established, contrary to Rosen's opinion [ibid., vi, p. 291], that nitrites which may be present in the culture solutions or mycelial extracts are not a cause of the wilting.

HERBERT (F. W.) & HUBBARD (J. W.). **Verticillium wilt (hadromycosis) of Cotton in the San Joaquin valley of California.**—*U.S. Dept. of Agric. Circ.* 211, 7 pp., 3 pl., 1932.

The disease of cotton caused by *Verticillium albo-atrum* which was recently described by Shapovalov and Rudolph from the

neighbourhood of Wasco in California [*R.A.M.*, ix, p. 380] is stated to have spread in 1930 to many places in the San Joaquin valley, where it is causing appreciable losses to the crop; one grower, in particular, estimated that the disease reduced his yield by one-third on a 40-acre field in 1929, for which reason he replaced cotton by lucerne in the next year. The first external symptom is a distinct mottling of the leaves with pale yellowish, irregular areas at the margins and between the main veins; in time these areas become more whitish and necrotic, and finally die and turn brown; later still the leaves fall, usually only leaving a few small ones at the ends of the branches. Simultaneously with the appearance of the first leaf symptoms, the wood at the base of the main stalk may show a browning of the vascular system, later becoming very pronounced.

Observations in 1930 on an experimental plot with 48 varieties of cotton showed that with the exception of Pima (Egyptian) cottons, none of the varieties tested exhibited any resistance; the Pima plants remained practically normal throughout, although examination at the end of the season revealed that most of the Pima plants in the infected area showed the brown discoloration of the wood characteristic of the disease. While no definite control measures are recommended for the present, a rotation of cotton with lucerne or some grain crops is suggested as a practical means of avoiding losses in the infected fields.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Une Microsiphonée à pigment rouge isolée de glandes sous-maxillaires.** [A microsiphonaceous fungus with red pigment isolated from the submaxillary glands.]—*Comptes rendus Soc. de Biol.*, cviii, 38, pp. 1186–1188, 1932.

From an infiltration of the sub-maxillary glands of an 11-year-old girl, the writers isolated a fungus forming a red pigment on potato juice at 27° C. and characterized by hyphae 0·5 to 0·7 μ and spherical arthrospores 0·9 μ in diameter. The intraperitoneal inoculation of a guinea-pig with an emulsion of the organism in physiological serum proved fatal in nine days, the parasite being recovered from the liver and spleen. The fungus is placed in the genus *Actinomyces* as *A. allenbachii* n. sp. A cure was effected by treatment with progressive doses of iodide.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Étude d'un Actinomyces isolé d'expectorations chez une femme suspecte de tuberculose pulmonaire.** [A study of an *Actinomyces* isolated from the sputum of a woman suspected of pulmonary tuberculosis.]—*Comptes rendus Soc. de Biol.*, cviii, 38, pp. 1188–1190, 1932.

From the sputum of a 56-year-old woman suffering from chronic bronchitis and suspected of pulmonary tuberculosis, the writers isolated a fungus characterized by branched hyphae 0·35 μ and arthrospores 0·6 μ in diameter. The only medium on which growth was made was bouillon with maltose, the optimum temperature for

development being 24° to 26° C. An emulsion of the organism in physiological serum was inoculated into two guinea-pigs with fatal results and it was recovered from the various internal organs affected. The fungus is referred to *Actinomyces pulmonalis* Roger, Bory, et Sartory 1909.

NEGRONI (P.). **Estudio micológico sobre cincuenta casos de micosis observados en Buenos Aires.** [A mycological study of fifty cases of mycosis observed in Buenos Aires.]—*Rev. Univ. Buenos Aires*, Ser. 2, XXIX, iv, viii, 3, 399 pp., 1 col. pl., 75 figs., 1931.

A comprehensive account is given of the writer's examination of fifty cases of human mycosis in Buenos Aires, Argentine Republic, with full clinical details and extensive notes on the morphology, biology, and taxonomy of the organisms concerned [*R.A.M.*, xi, p. 43].

Coccidioides immitis and *Rhinosporidium seeberi* [ibid., x, p. 662] are tentatively referred to the Chytridineae, notwithstanding their incapacity to form zoospores, which is probably due to adaptation to the parasitic mode of existence on man and certain animals.

COOPER (G. W.). **Outline of culture character studies of an undescribed species of Cryptococcus.**—*Amer. Journ. Trop. Med.*, xii, 1, pp. 97–100, 1932.

Morphological and biological studies were made of an apparently undescribed species of *Cryptococcus* isolated at the Western Reserve University School of Medicine, Cleveland, Ohio, from one out of 102 cases of black tongue, the remainder being of the common 'pseudo' or 'non-fungoid' type.

The fungus, to which the name of *C. quasilinguae-pilosae* n. sp. is given, is a yeast-like, double-contoured, ovoid cell, 3·9 to 8·7 μ in diameter, as compared with 3 to 6 μ for *C. linguae-pilosae* [*R.A.M.*, v, p. 301]. Acid was formed on dextrose, maltose, galactose, and levulose. There was no gas formation on any of the sugar media or litmus milk. Slight to marked pellicle formation was observed on various fluid sugars.

GRIGORAKIS (L.). **Morphologie et taxonomie du Spiralia mentagrophytes ou champignon à cultures plâtreuses.** [The morphology and taxonomy of *Spiralia mentagrophytes* or fungus of chalky cultures.]—*Comptes rendus Soc. de Biol.*, cix, 3, pp. 186–188, 1932.

The examination of a culture of *Spiralia* (*Trichophyton* or *Ctenomyces*) *mentagrophytes* [*R.A.M.*, vii, p. 99; x, p. 243] revealed the presence in the 'spindles' of 3 to 12 septa from which arose short filaments producing numerous aleuria. The 'spindles' are considered to be really only detached fragments of mycelium of variable length and they may be completely absent from pleomorphic cultures. Whorls with serrated spirals were present in large numbers and it is these bodies which doubtless led Langeron and Milochevitch to classify the fungus as a *Ctenomyces*, whereas

this genus was created by Eidam for species with perithecia and asci, unknown in the fungus in question.

FABIANI (G.). **Influence de la vaccination du milieu et l'addition d'antivirus sur la croissance d'Achorion schönleini.** [Influence of the inoculation of the medium and the addition of antivirus on the growth of *Achorion schönleini.*]—*Comptes rendus Soc. de Biol.*, cix, 5, pp. 403–404, 1932.

The inoculation of Sabouraud's medium with a white *Staphylococcus* completely prevented the growth of *Achorion schönleini*, sown 48 hours later. On the other hand, the development of the fungus was promoted by the addition to the medium of Besredka's staphylococcic antivirus (10, 25, or 50 drops per tube).

BALINA (P. L.) & NEGRONI (P.). **Intertrigo des orteils et onyxis dus à un nouveau parasite.** [Intertrigo of the toes and onychia due to a new parasite.]—*Ann. de Dermatol.*, Sér. VII, iii, 1, pp. 8–20, 11 figs., 1932.

The causal organism of intertrigo and onychia of the toes in Buenos Aires, previously referred to the genus *Cephalosporium* [*R.A.M.*, x, p. 459], is now regarded as occupying a position among the Mucedineae close to *Verticillium*.

SCOTT (J.). **Foil-wrapped cheeses: some deterioration factors.**—*Food Technology*, i, 7, pp. 276–277, 4 figs., 1932.

Crustless cheeses wrapped in tinfoil and packed in cardboard containers have been found to be seriously affected by a fungus belonging to the Perisporiaceae, which had evidently originated on the paper labels, penetrated the tinfoil, and reached the cheese [cf. *R.A.M.*, viii, p. 675]. The labels were puffy and drab-coloured, the printed colours having run into one another, the tinfoil was corroded by the chemical reactions of the mould, and the cheese emitted a foetid odour and was 'soapy' in texture, probably through the action of lipase on the fatty constituents. The omission of labels from wrapped cheeses is recommended.

WATERMAN (ALMA M.). **Rose diseases: their causes and control.**—*U.S. Dept. of Agric. Farmers' Bull.* 1547, 20 pp., 10 figs., 1932.

This is a revised version of the writer's account of the principal fungous and bacterial diseases of roses in the United States [cf. *R.A.M.*, vii, p. 446].

GRIEVE (B. J.). **Rose diseases and their control.**—*Journ. Dept. Agric. Victoria*, xxx, 2, pp. 92–94, 104, 2 figs., 1932.

The diseases dealt with in this further instalment of the author's series of articles on rose diseases and their control [*R.A.M.*, x, p. 792] are leaf scorch (*Septoria rosae*) [ibid., vi, p. 33; viii, p. 604], which has not yet been recorded in Australia, leaf spot (*Cercospora rosaecola*) [ibid., vi, p. 487; ix, p. 613], recorded in Victoria, *Phyllosticta rosae*, reported from Victoria in 1895 and Queensland

in 1911, *P. rosarum*, doubtfully recorded in Australia in 1904, and *Mycosphaerella rosigena*, reported from Queensland in 1915–16.

COOLEY (L. M.). **Black rot of Stocks.**—*Phytopath.*, xxii, 3, p. 270, 1932.

In 1929 and 1930 greenhouse stock (*Matthiola incana* var. *annua*) plants near Knoxville, Tennessee, were affected by a wilt due to *Bacterium campestre* [*Pseudomonas campestris*], which is believed to have been hitherto reported on this host only from Germany (*Arb. K. Biol. Anst. für Land- und Forstwirtsch.*, v, p. 489, 1907). The pathogenicity of the organism was proved by inoculation experiments.

BROOKS (F. T.). **A disease of the Arum Lily caused by Phyllosticta richardiae, n. sp.**—*Ann. of Appl. Biol.*, xix, 1, pp. 16–20, 1 pl., 1932.

This is a brief account of a serious disease of the arum lily (*Richardia africana*) observed in 1930 in the Scilly Isles in the open, and sent in 1931 to the author from plants grown under glass in Yeovil, Somerset. The chief symptom is the appearance of brown blotches on the leaf blades, petioles, stalks of the inflorescences, and the white spathes. When young the spots on the leaf blade and petiole are often surrounded by a narrow yellow zone. With age the blotches may extend until practically the whole leaf is destroyed, and occasionally the central parts of the spots fall out.

Isolations from diseased material yielded a fungus to which the name *Phyllosticta richardiae* n.sp. is given; it is pointed out that this binomial was already used by Halsted in 1894 for a similar disease of the arum in New Jersey, but as no diagnosis was then given, it is considered to be a *nomen nudum*. The fungus is characterized by roughly spherical, brownish-black pycnidia, 120 to 180 μ in diameter, with a circular ostiole, 20 to 30 μ across. The pycnospores are oval, often pointed at one end, and measure 3·7 to 7·3 by 2·7 to 3·7 μ (average 5·5 by 3·5 μ.). A brief account of the cultural characters of the fungus on various media is also given, and its diagnosis in English is appended.

Inoculation experiments showed that the organism is capable of infecting unwounded arum leaves under conditions of maintained high humidity, at temperatures fluctuating between 13° and 24° C. The petioles were also infected through wounds. In the author's opinion the disease should be easily controlled under glass by adequate ventilation ; in the field its spread may be checked by the prompt removal of all diseased foliage and flowers, crop rotation where possible, and suppression of weeds, as there is a possibility of the fungus being perpetuated on the latter.

HEMMI (T.) & KURATA (S.). **Notes on three diseases of Azaleas.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, Kyoto, 1, pp. 1–12, 2 pl., 2 figs., 1931. [Japanese summary.]

In the summer of 1930 various species of *Rhododendron*, including *R. obtusum* and *R. ledifolium*, at Kyoto, Japan, were affected by a disease causing the development of brown, spherical,

elliptical, or irregular patches, 3 to 15 by 2 to 10 mm., on both leaf surfaces. The dark brown to black, globose, subglobose, or irregular pycnidia, measuring 70 to 112 μ in height and 48 to 131 μ in diameter, are generally formed in the palisade tissue underlying the epidermis of the upper surface of the spots. The hyaline to pale olive, smooth, guttulate, straight or very slightly curved, continuous, ellipsoid, subglobose, ovoid, or irregular pycnospores measure 7·15 to 12·8 by 4·3 to 7·15 μ (average 10 by 5·7 μ). This description agrees with the characters of *Phyllosticta maximi* [*R.A.M.*, iii, p. 721]. An immature ascigerous fungus, believed to be *Venturia rhododendri,* was found in conjunction with the former and with *Pestalozzia* sp. on a specimen collected in October, 1930.

R. obtusum and *R. lateritium* suffered from a disease characterized by the presence on both leaf surfaces of circular or irregular spots, those on the upper being chestnut- or dark brown while on the lower they were light to yellowish-brown, sometimes with greyish centres, 1 to 10 mm. in diameter, usually 2 to 5 mm. The causal organism was identified as *Cercospora handelii* Bub., a new record for Japan. The short, simple, olivaceous, erect conidiophores, arising in fascicles from a small, tubercular, brown stroma, bear linear, curved, pale olivaceous, 5- to 14-septate conidia, 48 to 134·4 by 2·3 to 4·3 μ at the basal portion, the average dimensions being 70 to 115 by 3·2 μ.

R. macrosepalum, which grows wild near Kyoto, is liable to severe infection by *Melasmia rhododendri* (not hitherto reported on this species), forming spherical or irregular, black, shiny spots, less than 3 mm. in diameter, on one or both leaf surfaces. At an advanced stage these spots (the stromata of the fungus) become confluent and the affected leaves turn brown and shrivel, often remaining on the twigs until the following summer. The unicellular conidia produced in pycnidia inside the stromata during the summer are hyaline, fusoid, ovoid-fusoid, or allantoid, and measure 2·2 to 4·8 by 1 to 2 μ, the original measurements given by P. Hennings and Shira (*Engler's Bot. Jahrb.*, xxviii, p. 259, 1900) being 3 to 3·5 by 0·5 to 0·7 μ. The ascigerous stage is not formed until the winter or following spring. The elongated apothecia mature in the late spring or early summer; their openings first appear as curved cracks, gradually widening and turning grey and sometimes having a cup-shaped aspect. The subclavate or cylindrical, straight or slightly curved, short-stipitate or subsessile asci measure 99·2 to 147·2 by 11·4 to 14·3 μ and contain eight hyaline, elongated wedge-shaped, cylindrical, or elongated fusiform, straight or slightly curved, mostly uni- (occasionally bi- or quadri-cellular) ascospores, generally arranged biseriately but sometimes irregularly, and measuring 21·5 to 44·8 by 2·8 to 3·8 μ. The abundant septate, filiform paraphyses are mostly longer than the asci and 1 to 2·5 μ wide, their upper portions being incurved, hooked, or more often coiled.

From these characters the ascigerous stage of *M. rhododendri* was readily identified as a *Rhytisma*. The name *R. rhododendri* being already appropriated for a different fungus, the present organism is designated *R. shiraiana* n. sp.

Birmingham (W. A.) & Broadfoot (H.). **Powdery mildew of the Apple. Experiments for its control.**—*Agric. Gaz. New South Wales*, xliii, 2, pp. 147–150, 3 figs., 1932.

After outlining the geographical distribution and economic importance of powdery mildew (*Podosphaera leucotricha*) [*R.A.M.*, x, p. 604] in New South Wales, the authors state that in experiments since 1926 at Batlow good control of the disease was obtained by tipping all the diseased shoots, removing the infected spurs, and treating the trees with sulphur compounds, all of the latter that were tested having proved effective. In tests from 1928 to 1930 at Kentucky dritomic, atomized, or colloidal sulphur, followed by applications of lime-sulphur gave the best control of the mildew in 1928, but in the other two seasons the best results were obtained with lime-sulphur alone.

Cooley (J. S.). **Botrytis stem infection in Pears.**—*Phytopath.*, xxii, 3, pp. 269–270, 1932.

Botrytis stem infection of stored pears, which was prevalent in the 1930 crop at Hood River, Oregon [*R.A.M.*, xi, p. 115], is characterized by a sharp line of demarcation between the blackened tip and the sound tissue. The diseased portion is usually soft, water soaked, and liable to crumble on rubbing. As the storage season advances the discoloration passes downwards to the fruit. Pears infected by stem rot should not be kept for the late market, since the fungus spreads rapidly from one fruit to another. The lots showing severe stem infection (up to 18 per cent.) came from orchards bearing a heavy cover crop of vetch or clover, the dead and dying stems and leaves of which constitute a favourable substratum for the growth and sporulation of *Botrytis*. The air-borne spores invade the freshly picked fruit through the abscissed stem ends.

Anderson (H. W.). **Spraying experiments for disease control in 1931.**—*Trans. Illinois State Hort. Soc.*, lxv (*1931*), pp. 170–183, 1 graph, 1932.

Peach leaf curl [*Taphrina deformans*: *R.A.M.*, x, p. 248] was controlled in Illinois during 1931 by a dormant spraying with lubricating oil–Bordeaux, dendrol–Bordeaux, 4840 Dormant oil-lime sulphur (1 in 15), 4840 Dormant oil-flotation sulphur (16 in 100), and lime-sulphur 1 in 8. Oil combinations are necessary owing to the prevalence of San José scale on the peach trees. The lubricating oil recommended for mixing with Bordeaux is a light-grade oil of sp. gr. at 20° C. of 0·87 to 0·93, volatility at 110° C. for 4 hours not above 10 per cent., and viscosity at 100° F. 90 to 250 seconds (Saybold test). To each 100 galls. of 6–10 (hydrated lime)–100 Bordeaux, 3 galls. oil may be added. The oil may be emulsified by boiling with 1 to 2 lb. potash fish oil soap (40 per cent. soap) plus ¼ gall. water to each gallon of oil. A cold-mixed lubricating oil-Bordeaux emulsion [stated elsewhere to be made by pumping together equal parts of the oil and 6–10–100 Bordeaux mixture, passing this through the pump at least twice, and adding the necessary amount to make 100 galls. Bordeaux containing 1½

or 2 per cent. oil as required] may be used instead of the boiled soap emulsion.

Excellent control of apple scab [*Venturia inaequalis*] was again given by the ferrox, thylox, and dry wettable flotation sulphurs [ibid., x, p. 644], five applications being made between 22nd April and 15th June. In cases of mild infection 5 lb. of sulphur instead of 10 lb. per 100 galls. (the standard strength) was found to be ample for control. In one test, blotch [*Phyllosticta solitaria*] on the Ben Davis variety was also well controlled by flotation sulphur. Dry lime-sulphur (6 lb. per 100 galls. in the pre-bloom and calyx and 3 lb. in the 1- and 3-weeks sprays) gave excellent control of scab and showed much less injury than liquid lime-sulphur. Injury to foliage was observed following the 5-weeks spray on a number of the sulphur-treated plots and was attributed to the burning of the sulphur at high temperatures.

McWhorter (O. T.). **Peach leaf curl.**—*Better Fruit*, xxvi, 8, p. 25, 1932.

To control peach leaf curl [*Taphrina deformans*: see preceding abstract] in Western Oregon conditions growers are recommended to spray during December or before 15th January with Bordeaux mixture 6–6–50, it being essential to give the trees a thorough covering of spray before the buds burst. In Eastern Oregon a commercial lime-sulphur solution 1 in 8 may be used before the winter buds swell where control of insect infestation is desired.

Anderson (H. W.). **Problems on spray injury to the Peach.**—*Trans. Illinois State Hort. Soc.*, lxv (*1931*), pp. 454–468, 2 figs., 1932.

In certain seasons, such as 1930 and 1931, the loss to Illinois fruit growers from spray injury may be greater than that from the pests against which the treatment is applied. Peaches suffer from three types of spray injury, viz., (1) a marginal burn, followed by a 'corking off' process at the union of the healthy and injured portions; (2) a spotting or shot-hole effect in the interveinal regions, involving areas one-quarter to one-half an inch in diameter, turning purple on the under side and often dropping out; and (3) curling or crinkling of the leaf margins and midrib, usually associated with the foregoing but sometimes occurring independently. Defoliation is commonly a secondary effect of spray injury due to disturbance of the entire physiological activities. Twigs may develop brown areas near the leaf base, sometimes extending into the bark and causing canker formation at the nodes, while under certain conditions the exposed face of the fruit shows greyish, later dark brown or black, necrotic lesions. In an experimental plot sprayed with kaolith, a fluosilicate preparation, the fruit tended to ripen prematurely at the suture. This condition, to which the name 'soft suture' was given, had been observed in previous tests for the control of bacterial spot [*Bacterium pruni*: ibid., xi, p. 355].

Under Illinois conditions, all the above-mentioned types of spray injury except the last appear to be primarily due to lead arsenate,

the harmful effects of which may be minimized by the use of freshly slaked or fresh hydrated lime instead of magnesium lime and by the addition of zinc sulphate to the mixture (8 lb. zinc sulphate and 8 lb. lime per 100 galls. water) [cf. ibid., x, p. 225].

TEHON (L. R.). **Observations on Peach yellows in Illinois.**—*Trans. Illinois State Hort. Soc.*, lxv (*1931*), pp. 183–195, 1932.

Peach yellows [*R.A.M.*, xi, p. 354] is definitely known to have occurred near Philadelphia about 1791, though it was apparently recognized as a destructive disease at least forty years earlier. In Illinois the first serious outbreak took place in 1927, but reliable reports indicate that the condition was observed as early as 1886. Hitherto the sole method of mechanical transmission of yellows from diseased to healthy trees has been by budding, a fact that led to the suspicion of spread by nursery stock. However, an inspection during the last five years of some 250,000 peach trees aged 1 to 22 years showed that none of the 103 affected by yellows was less than five years old, the highest incidence of infection (7·5 per cent. of the cases) being in the oldest individuals. These data, taken in conjunction with closely similar records from Pennsylvania, appear to bring the role of nursery stock in the dissemination of yellows within very narrow limits, and it seems more probable that a number of common weeds constantly found in or near peach orchards are the major sources of infection. None of the common orchard weeds showed the yellow symptoms in their entirety, though *Erigeron canadensis* presents the typical growth habit of aster yellows [ibid., x, p. 601], while a peculiar type of witches' broom, strongly reminiscent of the willowy growth of yellows on the peach, affects *Campsis* [*Tecoma*] *radicans*. The possibility of insect transmission, e.g., by *Myzus persicae*, is briefly discussed.

In addition to ordinary yellows, three other types of the disease have been recognized in Illinois, namely, benign, in which the condition spreads slowly, if at all, and causes no noticeable decline in the health of the trees; non-infectious, characterized by the most marked and complete symptoms of yellows but not spreading from one tree to another; and mosaic-type, in which the affected individuals show the typical mosaic mottling of the leaves as well as the willowy growth and early ripening fruit associated with yellows.

DIPPENAAR (B. J.). **Fruit spots of the Kelsey and other Plum varieties.**—*Farming in South Africa*, vi, 72, pp. 525–526, 3 figs., 1932.

The valuable Kelsey plum, which is largely grown for export in the western Cape Province, is stated to be liable to three different types of spotting, known as sun scorch, Kelsey spot, and drought spot. Sun scorch spots occur chiefly on green fruit exposed to the north or north-west, whereas Kelsey spots, which are ¼ to 1½ in. in diameter, develop both on shaded and exposed fruit early in January, three or four weeks before the plums are ready for picking. The small, deep-seated, brown spots due to drought are generally not more than ¼ in. in diameter, and are found overlying

convex cavities, due to the rupture of the affected tissues, in the flesh of young, green plums towards the end of November or early December.

In the Kelsey variety 60 per cent. of the fruit of a tree or 50 per cent. of the trees in an orchard may be affected by these types of spotting, which render the plums unsuitable either for export or for the local market. Up to 20 per cent. of the fruit of the Burbank variety may be similarly diseased, the corresponding figures for Gaviota and Santa Rosa being 5 and 2 per cent., respectively. The October Purple and Prune d'Agen varieties are markedly susceptible to sun scorch but apparently not to Kelsey or drought spot.

No fungi or bacteria have been found associated with the types of spotting under discussion, which are tentatively attributed, as a result of three seasons' observations, to a lack of nitrogenous food, an inadequate supply of soil moisture, and high temperatures at the approach of maturity. Control measures should be based on the correction, as far as possible, of these conditions.

HANSEN (H. N.) & DAVEY (A. E.). **Transmission of smut and molds in Figs.**—*Phytopath.*, xxii, 3, pp. 247–252, 1932.

The results [which are discussed and tabulated] of investigations in California on the transmission of fig spoilage organisms [*R.A.M.*, x, p. 678] showed that the following mites and thrips act as carriers: the predaceous mites, *Sejus pomi* and *Cheyletus* sp. which feed on the common fig mite *Eriophyes fici*, and the thrips, *Frankliniella tritici*, *F. tritici* var. *californicus*, *Thrips bremneri*, *Liothrips ilex*, *Heliothrips fasciatus*, and *Leptothrips mali*. All the mites and at least two of the thrips, viz., *F. tritici* and *L. mali*, breed within the figs of both edible and capri crops. The thrips, unlike the mites, are not confined to the eye region but wander throughout the interior of the fig, and are thus probably more effective carriers of the spores of the various fungi, yeasts, and bacteria associated with spoilage of figs.

NYENHUIS (E. M.). **Experiments with 'export' of Papaws.**—*Farming in South Africa*, vi, 72, pp. 499–500, 2 figs., 1932.

The examination, after three weeks' storage at the Low Temperature Research Station, Capetown, at 36°, 40°, and 45° F. (90 per cent. humidity), of 207 boxes of Northern Transvaal papaws at two stages of maturity, showed that mould develops rapidly at the two former temperatures before the fruit has time to ripen. At 45° a fair amount of ripening takes place but the wastage is serious.

WRIGHT (C. W. B.) & WOODMAN (R. M.). **Problems confronting the sprayer. I. The volume of liquid needed to spray trees of various sizes and shapes.**—*Chem. News*, cxliv, 3749, pp. 116–122, 1 diag., 1 graph, 1932.

A tabulated account is given of the writers' investigations at a fruit farm in Norfolk in 1927 on the amount of spray fluid necessary to cover apple trees of different varieties, sizes, and shapes.

Groups of Lord Derby, Worcester Pearmain, Lane's Prince Albert, and Bramley's Seedling trees were sprayed when the foliage was at different stages of growth with a hand-power barrel pump connected to a 6 ft. lance with a medium nozzle. The wash consisted of soft dyke water and 0·75 per cent. fish-oil soft soap, and the volume applied to each group was accurately obtained in every case by subtracting the measured residue left in the barrel after a spraying from the initial amount.

The development of the foliage was found to play a large part in modifying the amount of spray fluid required to cover a tree. The first application (on 20th April) practically corresponded to a dormant spraying; as the leaves expand, the volume of liquid per unit volume for any variety of apple usually rises to a maximum and then decreases with later successive sprayings, the date of the maximum volume naturally being determined by varietal habit. The amount of spray used per unit volume of tree decreases with the size of the latter, apparently owing to the difficulty of thoroughly wetting the topmost portions of large trees and also the large branches. Especially when the foliage is heavy (as in the early June application) the tendency of the average workman sprayer is to wet only the external surface of the head of the tree, the internal branches and twigs readily escaping.

The average volume of spray per tree (in pints) for Worcester Pearmains was 5·57 on 20th April, 6·56 on 25th May, and 2·50, 4·07, and 6·25, respectively, for three groups treated on 7th to 8th June. For Lord Derby the amounts used were 9·24 in April, 11·27 and 10·67 on 5th and 23rd May, respectively, and 1·57, 2·58, 4·50, 7·31, and 9·67, respectively, for five groups sprayed on 7th to 8th June. For Bramley's Seedling: 13·64 in April, 13·73 and 27·17, respectively, for two groups on 5th May, 10·94 on 23rd May, and 3·86, 6·00, 9·58, 11·50, and 13·25, respectively, for five groups on 7th to 8th June. For Lane's Prince Albert: 3·25 in April, 3·94 and 9·07 on 5th May, 4·13 on 23rd May, and 2·56, 3·43, 4·92, and 5·70 on 7th to 8th June.

WRIGHT (C. W. B.) & WOODMAN (R. M.). **Problems confronting the sprayer. II. The volume of spray passing through nozzles of varying diameter at varying spraying pressures.** —*Chem. News,* cxliv, 3751, pp. 146–147, 1 graph, 1932.

In the authors' spraying experiments on apple trees [see preceding abstract] an attempt was made to ascertain the effects caused by the use of nozzles of varying diameters with varying pump pressures, plain water being the liquid chosen for these trials.

A Drake and Fletcher nozzle with three interchangeable, case-hardened steel disks, $\frac{1}{16}$, $\frac{3}{32}$, and $\frac{1}{8}$ in. in diameter, respectively, was used. A Vernier gauge was attached to the nozzle so that observations could be made at two definite swirl chamber depths, $\frac{19}{64}$ and $\frac{25}{64}$ in., representing the minimum and maximum compatible with easy, successful working. The nozzle was attached to a horizontal, rigid rod lance fed from a pressure spraying outfit invented and manufactured by C. E. Lack of C. Lack & Sons, Ltd., Cottenham. The pump pressures used were 30–300 lb. / sq. in.,

ascending by units of 30. Known volumes of water were sprayed, the temperature of which during the tests (July, 1931) ranged from 15° to 20° C.

It was found that for any given disk, the greater the depth of swirl chamber, the longer and more acute-angled was the jet thrown and the coarser the spray; with any given disk and a fixed depth of swirl chamber, the lower the pump pressure, the shorter and coarser the jet. The coarser the nozzle or the greater the pump pressure, the quicker the delivery; with any given nozzle, the deeper the swirl chamber, the less the period of delivery and the effect of pump pressure.

At a pump pressure of 30 lb. the times required to spray 10 galls. at $\frac{19}{64}$ in. depth of swirl chamber were 26 minutes 50 seconds, 15 m. 10 s., and 12 m. 5 s. for the fine, medium, and coarse nozzles, respectively, the corresponding figures at $\frac{25}{64}$ in. being 20 m. 5 s., 10 m. 35 s., and 5 m. 35 s., respectively. At 300 lb., $\frac{19}{64}$ in., the times for the fine, medium, and coarse nozzles were 12 m. 35 s., 8 m. 25 s., and 5 m. 30 s., respectively, the corresponding figures at $\frac{25}{64}$ in. being 9 m. 40 s., 4 m. 55 s., and 2 m. 45 s., respectively.

MARTIN (H.). **Studies upon the copper fungicides. I. The interaction of copper sulphate with calcium hydroxide.**—*Ann. of Appl. Biol.*, xix, 1, pp. 98–120, 4 graphs, 1932.

The purpose of the investigation described in some detail in this paper was to determine the chemical and physical properties of the precipitate of Bordeaux mixture, which render its efficacy in the control of certain fungal diseases of plants superior to that of all its commercial substitutes in paste or dust form. It was shown that at ordinary temperatures, the initial product of the interaction of cupric sulphate and calcium hydroxide solutions is the $4CuO.SO_3$ basic sulphate. In the presence of amounts of calcium hydroxide in excess of 0·75 equivalent, the basic sulphate is slowly decomposed with elimination of the sulphate radicle and the formation of a blue hydrated cupric oxide or cupric hydroxide which retains, by adsorption, part of the sulphate radicle. The hydrogen-ion concentration curve for the cupric sulphate-calcium hydroxide reaction shows that permanent alkalinity of the supernatant liquid is not reached until equimolecular amounts of calcium hydroxide have been added. The cupric hydroxide formed from the basic sulphate is stabilized by adsorbed sulphate ions. Continued washing of the precipitate with water freed from carbon dioxide removes the adsorbed sulphate and the excess calcium hydroxide, and the precipitate is thus dehydrated to form the nigger brown hydrated cupric oxide. Since the spray deposit of Bordeaux mixture on plants exposed to natural washing by rain remains blue, it appears that dehydration of the precipitate deposited by spraying is prevented by some chemical or physical change which occurs on drying. Experiments showed that physical factors are not concerned and that the blackening occurred when carbon dioxide was excluded from the washing water.

The investigation is considered to suggest that the good adhesive properties of the Bordeaux mixture precipitate are due to the formation *in situ* of a protective copper-containing deposit by the action,

primarily, of carbon dioxide. The failure of some of the substitutes may be caused by the inertness of their constituents towards the chemical changes which occur after spraying, and there was evidence that these changes may profoundly affect the value of sedimentation tests as criteria for the fungicidal efficacy of various Bordeaux mixtures.

THORNBERRY (H. H.). **The effect of certain dyes on plant pathogenic microorganisms.**—*Trans. Illinois State Acad. Sci.*, xxiii, 3, pp. 200–203, 1931.

Methyl violet [*R.A.M.*, ix, p. 580] was tested as a spray against bacterial spot of peach (*Phytomonas* [*Bacterium*] *pruni*) [see above, p. 520] at Illinois University during 1928–9. Toxicity studies in the laboratory indicated that the growth of the causal organism is inhibited at a concentration of 1 in 50,000. The field tests were made with a dilution of 1 in 2,000 which completely prevented the spread of infection.

Further laboratory tests were carried out with twelve dyes on seven micro-organisms [which are listed]. A comparison of the chemical structure of related dyes showed that a particular grouping in the molecule is associated with the selective bacteriostatic power. Thus, malachite green, which is more toxic than methyl violet, contains one methylated amino group instead of two. The inhibitory action which was manifested by all but three of the dyes apparently does not result in the death of the cell, which may resume its normal functions on the removal of the dye.

In preliminary trials on the penetration of dyes into tissue, apple segments were submerged in 1 in 100,000 solutions of methyl violet, gentian violet, and malachite green. After one hour the dyes were found to have penetrated about 1·5 mm. through the cut surface. The cells in the region of the absorbed dye were disjoined apparently as a result of enzymatic activity stimulated by the dyes.

ARNAUD (G.) & ARNAUD (MADELEINE). **Traité de pathologie végétale.** [Treatise on plant pathology.] Tome I. Vols. I, II, et Atlas. (Encyclopédie Mycologique, Tomes III, IV, V.)—1900 pp., 34 col. pl., 702 figs., Paris, Paul Lechevalier et fils, 1931.

These three well-produced and lavishly illustrated volumes which form Tome I of the authors' Traité de pathologie végétale, while they are also Tomes III, IV, and V of Lechevalier's Encyclopédie Mycologique, contain 702 original figures in addition to 34 coloured plates (reproduced separately in Tome V of the Encyclopédie) by Mme S. Ballings, the intention being to have about 100 coloured plates in the completed Traité. The entire work will consist of three parts of unequal length. The first part is an introduction designed to familiarize readers who are not phytopathologists with the technical ideas elaborated in the second part. The second, and principal, part of the work is devoted to full description and study of the various diseases, arranged under hosts, and so treated as to be understood by laymen as well as specialists, one of the chief aims of the authors being to give an essentially practical account of all the aspects of each disease. Tome I, besides the introduction, contains the section of the second part dealing with the diseases of

woody plants other than forest or ornamental trees or shrubs. The third and shorter part is to complete and conclude the second, and will deal more fully with those purely scientific questions which are mentioned in the introduction or briefly referred to in the mycological study of the pathogen which ends the article on each disease. Tome I, Vol. I contains the introduction of 100 pages, covering briefly such points as the history of plant pathology, the classification of plant diseases, general methods of prevention and control, fungicides and the requisite apparatus for their application, and climatology; there is also a bibliography of works dealing with this aspect of the matter. The same volume also contains sections on vine diseases, general considerations on diseases of fruit trees, and a detailed account of the diseases of the apple.

As an example of the full and comprehensive treatment accorded to the various subjects the section on vine diseases may be cited. This consists of 542 pages with nearly 200 figures. It begins with an historical account of vine cultivation in Europe and North America (the latter is brief) and proceeds to a very valuable survey of all the cultivated varieties, the production of hybrids, a general list of vine diseases and general considerations applicable to them, and their prevention and control. This is followed by articles on the diseases taken separately. Mildew (*Plasmopara viticola*) is accorded nearly 80 pages, dealing in turn with general considerations, history, symptoms, conditions necessary for infection, control, and a mycological study of the pathogen, each section, as throughout the book, having its own bibliography of references in English, French, German, and Italian.

Tome I, Vol. II deals with diseases of pears, quinces, and other pomaceous fruits, stone fruits, bush fruits, strawberries, and Mediterranean trees. This last section includes among other economic plants, olives, citrus, mulberry, loquat, and date palms, the various diseases being less exhaustively and authoritatively examined than those in the preceding part, in accord, no doubt, with their relatively lesser importance in France. Citrus diseases, for example, are allotted only 57 pages, though the existing literature is sufficiently cited to enable the fuller accounts of the various diseases to be traced. One omission which may be noted is the absence of a specific reference to the occurrence of *Phytophthora hibernalis* on citrus in Europe [cf. *R.A.M.*, v, p. 296; ix, p. 105].

So far as concerns the subject matter dealt with in these three volumes, the work is the most comprehensive, complete, and best illustrated treatise that has yet appeared. Special commendation may be given to the numerous excellent bibliographies following each section of the work, which are comprehensive, up to date, and pleasingly free from typographical errors.

SORAUER (P.). **Handbuch der Pflanzenkrankheiten. Dritter Band. Die pflanzlichen Parasiten. Zweiter Teil. Fünfte, neubearbeitete Auflage.** [Handbook of plant diseases. Volume III. The vegetable parasites. Part II. Fifth revised edition.]—viii + 948 pp., 195 figs., Berlin, P. Parey, 1932.

Nearly four years have elapsed since the publication of Part I

of the section on vegetable parasites in Sorauer's 'Handbook of plant diseases' [*R.A.M.*, vii, p. 733], the long delay being due to the death of one co-editor (Noack) and the withdrawal of another (Höstermann). In the present work Dr. O. Appel was assisted by Drs. Wollenweber, Laubert, Pape, Köhler, Zillig, Münch, Richter (who prepared the comprehensive subject index of nearly 50 pages), and Stapp. A great many of the illustrations and much of the text are new, while the references to phytopathological literature, given in the form of copious footnotes, have been brought up to date.

The greater part of the present volume deals with the diseases caused by Basidiomycetes (including the rusts and smuts) and Fungi Imperfecti, these two sections comprising a total of 830 pages. This main part is followed by short chapters dealing with parasitic algae (11 pages), lichens (10 pages), and parasitic phanerogams (27 pages). The diseases of tropical plants are fully discussed under the various fungi concerned. Altogether this treatise, in its present amplified and extensively documented form, is unquestionably one of the best works on the subject that has hitherto appeared.

RÉGNIER (R.). **L'organisation moderne de la protection des végétaux d'après l'exemple de quelques grands pays.** [Modern organization of plant protection as exemplified by some important countries.]—*Ann. des Epiphyties*, xvii, 2–3, pp. 113–247, 30 figs., 4 maps, 1931. [Received May, 1932.]

In this paper the author reviews in some detail (but chiefly from the entomological point of view) the organization of the plant protection services in the United States, Great Britain, Germany, Czecho-Slovakia, Holland, and Belgium, as seen by him during personal visits to these countries. From the experience thus gained he attempts to formulate a plan for the creation of a national plant protection service in France.

MCARDLE (R. E.). **The relation of mycorrhiza to conifer seedlings.**—*Journ. Agric. Res.*, xliv, 4, pp. 287–316, 2 pl., 7 figs., 1932.

After a brief review of the literature dealing with the nature and functions of mycorrhiza in plants, the author states that his continued investigation of these formations in the Saginaw Forest, Michigan [*R.A.M.*, x, p. 482], during which notes were taken on their seasonal occurrence and their relationship to the hydrogen-ion concentration of the soil and humus, showed that 14 species of Basidiomycetes [a list of which is given] were nearly always associated with the roots of the Norway spruce (*Picea excelsa*) and the northern white pine (*Pinus strobus*). *Tricholoma personatum*, *Lycoperdon gemmatum*, *Clitocybe rivulosa* var. *angustifolia*, and *C. diatreta* were induced by a technique devised by the author [details of which are given] to form mycorrhiza under controlled conditions on the roots of *Picea excelsa* and *Pinus strobus* seedlings grown on synthetic nutrient media. The experiments showed that the formation of mycorrhiza is independent of the presence or absence of nitrogen or of the form in which it is present in the

nutrient solutions. There was some evidence that when the nitrogen is present only in organic compounds, especially complex proteins, the seedlings show signs of nitrogen starvation which is not alleviated by the presence of mycorrhiza on their roots. It was further shown that the formation of mycorrhiza depends on the contact of the right species of fungal mycelium with the growing root tip, the elongation of which ceases on the formation of the mycelial mantle. In some of the cases examined the internal mycelium was both inter- and intracellular, in others it was only between the cells. No penetration of the hyphae was found in older roots. Maintenance of the fungi in pure culture for over a year did not apparently reduce their ability to form mycorrhiza rapidly and in large numbers. Attempts to induce the formation of mycorrhiza with species of *Penicillium*, *Rhizopus*, and *Mucor* failed.

The investigation is stated to have given no conclusive proof that the presence of the mycorrhiza is either helpful or harmful to the seedlings. No trace of the digestion of the intracellular hyphae could be found. Nevertheless the writer is of opinion that seedlings and probably also larger trees are benefited by the association with the fungi.

CAPPELLETTI (C.). **Sulla resistenza dello stolofillo di 'Tulipa silvestris L.' alla penetrazione dei miceli.** [On the resistance of the stolophyll of *Tulipa silvestris* L. to the penetration of mycelia.]—*Rendic. R. Accad. Lincei*, Ser. 6, xiii, 12, pp. 937–940, 2 figs., 1931.

In his studies of the fungal invasion of the seeds of Liliaceae [cf. *R.A.M.*, xi, p. 387] the author investigated the mode of resistance shown by the underground organ characteristic of certain Liliaceae and termed the 'stolophyll' by Chiarugi (*Nuov. Giorn. Bot. Ital.*, N.S., xxx, pp. 172–199, 1923). This organ, having apparently leaf and stem functions, resembles a thick, whitish, almost cylindrical root.

Sections of different parts of the stolophyll of *Tulipa silvestris* plants in no instance showed any mycelium in the parenchymatous tissues, though the roots of the same plants were constantly heavily infected in the cortical parenchyma by mycorrhizogenous mycelia.

That the stolophyll escapes infection may partly be due to its rapid growth and the short time it remains in the soil, but seems chiefly to depend on its anatomical structure. It is protected in the epidermis by a continuous, thin, distinct, crinkled cuticle, underneath which the cellulose membrane is thickened, forming a continuous and highly protective covering all round. Beneath the epidermis there is a layer of probably collenchymatous cells, though the thickening is not marked at the angles and is mainly confined to the cell walls parallel to the surface of the organ. A very similar structure exists in the cavity of the stolophyll, which is also bounded by a cuticle underneath which is a very thick cell wall. Inside the cavity hair-like growths develop, the hairs being always covered by cuticle. Wounds made in the epidermis healed with great rapidity, a deep corky layer being formed.

When bulbs of *T. silvestris* were grown in Knop's nutrient solution and inoculated with a *Penicillium*, *Mycogone tulipae*, a *Rhizoctonia* isolated from *Nothoscordum fragrans* Kunth, and a fungus taken from the roots of lucerne, the roots rapidly became infected, but the stolophylls remained unaffected, although frequently their epidermis was covered with mycelium.

LEEMANN (A. C.). **The problem of active plant immunity.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxv, 17–20, pp. 360–376, 1932.

After a general discussion of the problems involved in the conception of active plant immunity with particular reference to the production of antibodies in animals and plants, the writer describes a series of experiments conducted at the Division of Plant Industry, Pretoria, to ascertain whether the 'holistic' properties of the cell [cf. J. C. Smuts, 'Holism and Evolution'] can be modified, by the introduction into the soil of certain substances, in such a way as to obtain a state of increased resistance. The test plant used was the Early Gluyas wheat variety, and the pathogen was *Helminthosporium sativum*, a highly virulent strain of which was cultured on a medium consisting of 10 gm. each of lactose, galactose, and maltose, 0·5 gm. each of asparagin and glycocol, 2 gm. KH_2PO_4, 1 gm. $MgSO_4$, 3 gm. $FeSO_4$, agar 20 gm., water 1,000 gm., and 20 c.c. soil extract from 100 c.c. soil + 200 c.c. water. It was evident from the cultural experiments that the fungus prefers amino acids to nitrates or nitrites. The wheat seedlings (of which there were about 12,000 altogether, 50 in each Petri dish of 22 cm. diameter, containing a layer of soil about 1 cm. deep) were inoculated by smearing conidial suspensions of *H. sativum* on the stems and leaves and were kept covered with bell jars to maintain a saturated atmosphere. The substances to be tested were thoroughly mixed with the soil in the dishes.

A fungus extract was made by adding water to an agar culture of *H. sativum*, which was kept at 47° C. for four days, when seeds were soaked in the extract for 21 hours at ordinary temperature. A first lot of seeds was immediately placed in soil with and without this extract. After the seedlings developed they were then inoculated with *H. sativum* and showed very heavy infection. A second lot of the soaked seeds was dried for 14 days and then germinated, the resulting plants showing very weak infection when inoculated, i.e., a decreased susceptibility. An undetermined fungus was grown on Raulin's medium, which was eventually poured off and treated with a mixture of adsorbents: kaolin, ortho-aluminium hydroxide, ferrihydroxide, infusorial earth, silica, tricalcium phosphate, and animal coal. The liquid was then filtered, the filtrate and residue on the filter being added separately to the Petri dishes and thoroughly mixed with the soil. It was found that *H. sativum* was able to infect the plants treated with the filtrate slightly on the stems and severely on the leaves, while with the adsorbents the reverse was the case. Evidently, therefore, the adsorbents separate two components of the fungus secretion, one of which increases while the other decreases the susceptibility of the plants. This test shows clearly that secretions of fungi penetrate into plants, and that these substances, on incorporation

into the protoplasm, can modify its susceptibility to the selected pathogen. Similar experiments [which are described] with *Bacterium fluorescens* and other organisms also produced, under certain conditions, an increased resistance in the wheat plants to infection by *H. sativum*.

Diseased plants attacked by *H. sativum* were washed and left in the water for 21 hours. Seeds were treated with the extract thus obtained and the seedlings inoculated with the pathogen, heavy infection resulting in all cases. The soil on which diseased plants had grown was treated with tap water and the extract tested for its effect on susceptibility. When this extract was added to the soil in the dishes it increased the susceptibility of the seedlings to subsequent inoculation with *H. sativum*, but when seeds were soaked in the extract only slight infection was obtained on inoculation. An alcohol extract of the soil was also made, stirred well, and the supernatant cloudy liquid filtered. The coarse parts left behind in the vessel were tested as before and resulted in severe infection, as did also a water extract of them, whereas the fine particles on the filter and the water extract of that residue gave only slight infection. The immunizing effect of the fine particles is attributed to the micro-organic flora that they contain. This test shows that the immunizing factor of the soil is water-soluble.

The mycelium of *H. sativum*, grown on a liquid medium, was killed by heat and left to decompose in an incubator at 25°; after a fortnight it turned brown and was added to the soil, where it caused a marked access of resistance to *H. sativum* infection in the wheat plants grown in this soil. Susceptibility was augmented, however, by the killed but undecomposed, and by the living mycelium of *H. sativum*. In a test with the above-mentioned undetermined fungus, the susceptibility of the seedlings to *H. sativum* was increased by the addition to the soil of pounded mycelium mixed with sand or killed on a water bath, while a decrease of susceptibility followed the immersion of the seed in an aqueous extract of the mycelium, living or dead. The substance producing the immunizing effect would thus appear to be thermostable. The mycelium of the undetermined fungus was submitted to a number of extracting liquids, which were allowed to evaporate at ordinary temperature before the extracted substances were added to the soil. The distilled water extract allowed moderate infection on the stems and severe on the leaves; that from alkaline water, acid water, methanol, and amyl alcohol, permitted severe infection. When the treated mycelium itself was added to the soil strong infection was secured with all treatments except ethyl alcohol (very weak) and distilled water (similar to the extract).

An increase of susceptibility was produced by the interaction of *H. sativum* with various organisms, while with others a decrease was obtained [cf. ibid., x, p. 719]. The tests were made by growing the other organisms in a liquid, filtering through a Chamberland filter, and inoculating the filtrate with *H. sativum*. The culture liquid in which *H. sativum* was thus grown was then added to the soil. The reverse experiment, in which *Bact. fluorescens* was grown in the filtrate of *H. sativum* cultures, gave increased susceptibility.

Immunizing substances were also produced in the lipasic fermentation of oils and phosphatides (soy-bean oil or lecithin, plus lipase).

The underlying idea in these investigations is that the aim of active plant immunity should be to modify the holistic properties of the cell within its fluctuation value (limits within which the cell itself is not injured) through substances added to the soil so as to obtain a state of higher resistance in plants grown in the soil so treated.

Davis (W. H.). **Single spore isolation.**—*Proc. Iowa Acad. Sci.* (*1930*), xxxvii, pp. 151–159 [undated, received May, 1932].

A brief historical review is given of the methods of single spore isolation developed by bacteriologists and plant pathologists from de Bary (1872) to Dickinson (1926) [*R.A.M.*, v, p. 377] in connexion with the study of the life-history, polymorphism, physiology, parasitism, and classification of micro-organisms.

Klapp (E. L.). **Ökologie und Abbau der Kartoffel.** [Ecology and degeneration of the Potato.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, viii, 9, pp. 213–218, 1932.

In connexion with a general survey of the problem of potato degeneration in relation to ecology in Germany [*R.A.M.*, xi, p. 395], the writer presents and briefly discusses the various hypotheses of the etiology of the virus diseases, and also gives full details of a system of experimentation (adapted both to large- and small-scale observations) on the influence of different places of origin and cultivation on the health and productivity of the progeny.

Cleveland (C. R.). **The relation of insects to the transmission of Potato leafroll and Tomato mosaic in Indiana.**—*Indiana Agric. Exper. Stat. Bull.* 351, 24 pp., 2 figs., 1931. [Abs. in *Exper. Stat. Record*, lxvi, 3, pp. 238–239, 1932.]

Under Indiana conditions potato leaf roll is transmitted chiefly by the aphid *Myzus persicae* and the leafhopper *Empoasca fabae* [cf. *R.A.M.*, x, pp. 49, 163, 747, 812]. The pink and green potato aphid (*Macrosiphum solanifolii*) [*M. gei*], a potential carrier, is not sufficiently abundant to function as a major factor in transmission. Cage tests indicated that the potato flea beetle (*Epitrix cucumeris*) is probably not an important factor.

It is believed that extremely heavy infestations of leafhoppers may result in less spread than lighter infestations, as by their adverse effect on the physiological processes of the plant the former inhibit the transfer of virus to the tuber. Aphids, on the other hand, caused less direct damage and therefore the more numerous they were the more actively they transmitted leaf roll to the progeny.

M. persicae is believed to be mainly responsible for the insect transmission of tomato mosaic from tomato to tomato, and to a less extent from wild hosts to tomatoes. *Empoasca fabae*, the onion thrips [*Thrips tabaci*], and the common red spider [*Tetranychus telarius*] appeared to be capable of transmitting tomato mosaic

but are considered unimportant. Insects, chiefly *M. persicae*, are held responsible for at least 50 per cent. of the annual spread of tomato mosaic in Indiana.

CLINCH (PHYLLIS). **Cytological studies of Potato plants affected with certain virus diseases.**—*Scient. Proc. Roy. Dublin Soc.*, N.S., xx, 15, pp. 143–172, 5 pl., 1932.

This is a detailed account of the author's cytological investigation of potato plants affected with certain virus diseases, namely, simple mosaic, interveinal mosaic, crinkle, aucuba mosaic, streak, and leaf roll. The results showed that in the case of the three first-named diseases the chlorotic areas of the leaves are thinner than the green ones, the cells within the discoloured areas frequently contain fewer and smaller chloroplasts than normal, and in mosaic-infected leaves excessive quantities of tannin and fat are present in the chlorotic cells. In aucuba mosaic the chlorosis is caused by loss of pigment associated with an excess of starch in the plastids. In crinkle the cells of the green areas are often abnormally long and narrow, and they are closely set together, probably owing to retarded growth of the veins and of the chlorotic cells surrounding them; in the other diseases the cells of diseased and healthy parts are similar to one another. In leaf roll the cell contents of young and apparently still healthy leaves do not show any visible abnormality, but as the disease develops abnormal starch accumulations arise in certain cell groups throughout the lamina, until finally the chloroplasts of every cell are bloated with starch and abnormally large starch grains are present in the petiole and the stem.

Intracellular vacuolate inclusions (X-bodies), similar to those described by other workers on virus diseases [cf. *R.A.M.*, xi, p. 335], were found to be present in the chlorotic areas of leaves affected with simple mosaic, interveinal mosaic, crinkle, and streak, but not in aucuba mosaic or leaf roll plants, nor in healthy leaves. These bodies were most abundant in interveinal mosaic and crinkle plants that were suffering from the prolonged effects of the diseases; in young diseased plants they were inconspicuous. They were shown to contain mitochondria like the cytoplasm of a normal cell, and to be associated in certain stages with numerous fatty globules. It is considered that the cells containing the X-bodies are in a state of low vitality, and there was evidence in the later stages of a breakdown of the lipoid-protein complex of their cytoplasm. The suggestion is made that the X-bodies arise as a result of as yet unknown changes in the viscosity of the cytoplasm, and they are considered to be an effect and not a cause of disease.

MARTIN (W. H.). **Certified seed Potatoes and seed disinfection.**—*Amer. Potato Journ.*, ix, 3, pp. 33–37, 1932.

Replying to numerous complaints from New Jersey potato growers concerning the presence of scab [*Actinomyces scabies*] and scurf (*Rhizoctonia*) [*Corticium solani*] in certified seed, the writer points out that small percentages of both these diseases are generally permitted by the various States supplying New Jersey,

as well as by Canada [*R.A.M.*, x, p. 745]. Only in New Jersey was any modification of the tolerance regulations made during 1931; the present permissible limits are 10 per cent. of tubers with an average of more than five shallow scab spots exceeding in the aggregate an area of 1 in. in diameter; 5 per cent. with more than three deep scab spots covering the same area; and 10 per cent. showing shallow or deep scab. Not more than 10 per cent. of the tubers may show over five scurfed areas or more than 50 sclerotial bodies covering a total area of more than 1 in. in diameter; more than 5 per cent. with 25 sclerotial bodies covering an aggregate of 2 in.; or more than 10 per cent. of the tubers with any form of *C. solani*.

Schorffeste und schorfanfällige Kartoffelsorten. [Potato varieties immune from and susceptible to scab.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 3, pp. 18–19, 1932.

A list is given, based on three years' official tests at the Biologische Reichsanstalt, showing the reaction of a number of standard potato varieties to scab [*Actinomyces scabies*: *R.A.M.*, xi, p. 320]. The 'practically immune' group contains four varieties, viz., Ackersegen, Dauerragis, Jubel, and Marschall Hindenburg; the fairly resistant 15, among which are Albabona, Arnica, Berlichingen, Erdgold, Maibutter, Prof. Gisevius, Rotkaragis, and Tannenberg; the less resistant 13, represented by Bismarck, Cellini, Datura, Deodara, Goldfink, Lichtblick, Prozentragis, and Vesta; and the susceptible 79, including Allerfrüheste Gelbe, Alma, Beseler, Daber, Edeltraut, Eigenheimer, Frühe Ertragreiche, Hörnchen, and Rosen, Glückauf, Goldappel, Gratiola, Heimat, Industrie, Juli, Konsum, Kuckuck, Max Delbrück, Odenwälder Blaue, Parnassia, President, Preussen, Roode Star, Silesia, Wekaragis, Winterragis, and Wohltmann.

LINDFORS (T.). **Mot Potatiskräfta immuna Potatissorter.** [Potato varieties immune from Potato wart.]—*Landtmannen, Tidskr. för Landtmän*, xv, 12, pp. 250–251, 1932.

Official experiments have been in progress in Sweden for some years to test the reaction of a number of standard potato varieties to wart disease [*Synchytrium endobioticum*: *R.A.M.*, ix, p. 670]. In this paper the writer gives particulars of the yields obtained in 1930 and 1931 from some of those recognized as immune. Among the starch varieties, Hellena, Parnassia, and Wekaragis proved superior to Wohltmann, which was used as a control. Experiments in different parts of the country with some immune varieties in comparison with Birgitta and Up-to-Date showed that King George V, Majestic, Rosafolia, and Erdgold may be relied upon for good yields in central Sweden, where Ackersegen and Hindenburg were less satisfactory than in the south. Preliminary tests in the north also gave promising results as regards King George V, Rosafolia, and Majestic. So far none of the immune varieties appears to be quite as suitable for the early market as Early Puritan and Rose; Kuckuck, Juli, and Dargill Early are about equal in productivity to Early Puritan but mature some days later.

CHAMBERLAIN (E. E.). **Corticium disease of Potatoes. III. Laboratory and field methods for testing the efficiency of seed treatments.**—*New Zealand Journ. of Agric.*, xliv, 1, pp. 42–47, 1932.

In this further paper on the *Corticium* [*solani*] disease of potatoes [*R.A.M.*, xi, p. 260] the author states that the efficacy of the various seed tuber treatments recommended for its control may be usefully determined in the laboratory by testing the sclerotia taken from treated and dried tubers for germination on potato dextrose agar; any sclerotia remaining viable after treatment should be growing by the end of the fifth day. Experiments over two years in New Zealand showed, however, that the results of such tests do not always agree with those of field trials, in which the percentage of infection is frequently much higher than that which might be inferred from the corresponding laboratory experiments. In discussing the possible causes of this discrepancy, such as the presence and spread of the fungus in the fields, it is suggested that probably the survival after treatment of some of the sclerotia in soil is due to some factor or factors not present on potato dextrose agar.

CHAMBERLAIN (E. E.). **Corticium disease of Potatoes.**—*New Zealand Journ. of Agric.*, xliv, 2, pp. 122–126, 1 fig., 1 graph, 1932.

Concluding his investigations into the *Corticium* [*solani*] disease of potatoes in New Zealand [see preceding abstract] the author gives brief details of further attempts at control made with the acidulated corrosive sublimate treatment as well as with organic mercury compounds and states that the evidence obtained as a result of the whole investigation indicates that the benefits accruing from seed treatment are doubtful, since the disease appears to have little effect on the yield, the treatment itself is risky and may depress the yield, and the chances of keeping a line reasonably clear without treatment every second or third year are small. Of the nine tests of acidulated corrosive sublimate on *Corticium*-infected potatoes, only two produced a significant increase in yield while one gave a significant reduction. Seed treatment by ordinary growers, therefore, is not regarded as justifiable. Brief directions as to chemical treatment are given for growers wishing to obtain clean potatoes for special purposes, e.g., for exhibition.

ROTHMALER (B.). **Über die Herznekrose bei der Kartoffelsorte 'Böhms Allerfrüheste Gelbe'.** [On heart necrosis in the Potato variety 'Böhms Allerfrüheste Gelbe'.]—*Thesis, Univ. of Jena*, 48 pp., 1931. [Abs. in *Fortschr. der Landw.*, vii, 11, p. 305, 1932.]

The Böhms Allerfrüheste Gelbe potato variety is characterized by a tendency to necrosis of the cells in the central portion of the tuber, often leading to the development of a cavity, and a study of the condition was undertaken by the writer. The disturbance was definitely shown to be of non-parasitic origin and to be preceded by the production of an oxidase in the pith, this process being apparently peculiar to the variety under observation. The 'heart necrosis' of Böhms Allerfrüheste Gelbe is considered to be entirely

distinct from the 'hollow heart' of other varieties with a high starch content [*R.A.M.*, x, p. 749], which is attributed to the purely mechanical rupture of the interior of the tuber under the influence of an abnormally wet late summer or early autumn following a lengthy dry spell [ibid., v, p. 516]. Field experiments showed that the brown discoloration of the medulla typical of heart necrosis is favoured by abundant supplies of nitrogen, wide spacing, and alternating wet and dry periods. [A summary of this paper is given in *Pflanzenbau*, viii, p. 304, 1932.]

COOK (H. T.). **The diseases of Sweet Potatoes in Virginia and methods for their control.**—*Virginia Truck Exper. Stat. Bull.* 76, pp. 975–988, 3 figs., 1931.

Popular notes are given on the following diseases affecting sweet potatoes in Virginia, with directions for their control: stem rot (*Fusarium batatatis* and *F. hyperoxysporum*), black rot (*Ceratostomella fimbriata*), scurf (*Monilochaetes infuscans*) [*R.A.M.*, x, p. 404], foot rot (*Plenodomus destruens*) [ibid., x, p. 268], soil rot or pox (*Actinomyces* sp. or *Cystospora batata*) [ibid., viii, p. 598], southern wilt (*Sclerotium rolfsii*), mosaic [ibid., x, p. 268], soft rot (*Rhizopus nigricans*), dry rot (*Diaporthe batatatis*) [ibid., iii, p. 679], Java black rot (*Diplodia tubericola*) [ibid., x, p. 269], surface rot (*F. oxysporum*) [ibid., vi, p. 252], and various disorders of minor importance.

TOCHINAI (Y.). **The black rot of Rice-grains caused by Pseudomonas itoana, n. sp.**—*Ann. Phytopath. Soc. Japan*, ii, 5, pp. 453–457, 1932. [Japanese summary.]

A partial blackening of rice grains was first observed by Prof. S. Ito in 1918 and was attributed to an unknown species of bacterium. Recent studies by S. Iwadare (*Journ. Sapporo Agric. and Forest.*, xxii, p. 458, 1931: Japanese) showed that this black rot is distributed throughout the island of Hokkaido, occurring rather sparsely, however, in the southern districts. The apical part of the grain is chiefly affected, the seed coat, aleurone layer, and upper part of the endosperm turning black and dying while the inner tissues remain unchanged. The causal organism, a bacterium, was isolated from 62 per cent. of the grains examined and shown by inoculation experiments to enter through wounds at the milky ripe stage.

The present writer's investigations of Iwadare's material showed that the agent of black rot is a short rod with rounded ends, occurring singly or in pairs, 1·2 to 3 or up to 3·5 μ long by 0·5 to 0·8 μ in breadth, motile by means of one or (more rarely) two unipolar flagella. The organism forms neither spores nor capsules, is Gram-negative, but stains readily with the ordinary aniline dyes. On agar media the colonies are yellow, glistening, convex, becoming thin and granular with age, and somewhat viscid. Nitrates are reduced; no acid or gas produced from sugars or glycerine; milk is coagulated and litmus milk slightly reddened after long standing; indol is formed but not ammonia; growth occurs in Uschinsky's and Cohn's solutions (weak in the latter). The minimum, optimum, and maximum temperatures for growth are below 10°, 29°, and 38° C., respectively, the thermal death point being 50° to 51°. The

group number of the black rot organism, which is named *Pseudomonas itoana* n. sp., is 212·3333523 according to the classification of the Society of American Bacteriologists.

HEMMI (T.) & NOJIMA (T.). **On the relation of temperature and period of continuous wetting to the infection of the Rice plant by Ophiobolus miyabeanus.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, Kyoto, 1, pp. 84–89, 1931. [Japanese, with English summary.]

An account is given of the writers' studies on the relations of temperature during the initial stages in a moist chamber to the infection of the rice plant by the conidial stage (*Helminthosporium oryzae*) of *Ophiobolus miyabeanus* [*R.A.M.*, x, p. 542]. The seedlings were sprayed with a conidial suspension and kept at various constant temperatures (20°, 25°, 30°, 35°, and 40° C.). The minimal periods of continuous wetting necessary to secure leaf infection of the seedlings were found to be 8 hours at 20°, 4 at 25° and 30°, and 6 at 35°. At 40° infection seems scarcely possible. The data on the maximum number of lesions per leaf indicate that the optimum temperature for the rapid development of the initial stages of leaf infection is near 25° to 30°, according closely with that for the best germination and growth of the causal organism.

HEMMI (T.) & SUZUKI (H.). **On the relation of soil moisture to the development of the Helminthosporium disease of Rice seedlings.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, Kyoto, 1, pp. 90–98, 1931. [Japanese, with English summary.]

The results of inoculation experiments with *Ophiobolus miyabeanus* [see preceding abstract] on rice seedlings grown on soils with a varying moisture content showed that plants cultivated under dry conditions are more susceptible to infection by this fungus than those receiving a plentiful supply of moisture. Similar results have been obtained in experiments with the causal organism of rice blast (*Piricularia oryzae*) [*R.A.M.*, xi, p. 400].

SETO (F.). **Experimentelle Untersuchungen über die hemmende und die beschleunigende Wirkung des Erregers der sogenannten 'bakanae'-Krankheit, Lisea fujikuroi Sawada, auf das Wachstum der Reiskeimlinge.** [Experimental investigations on the inhibitory and acceleratory action of the causal organism of the so-called 'bakanae' disease, *Lisea fujikuroi* Sawada, on the growth of Rice seedlings.]—*Mem. Coll. of Agric. Kyoto Imper. Univ.*, 18 (Phytopath. Ser., 4), 23 pp., 1 pl., 1932.

A fully tabulated account is given of the writer's investigations in 1930 on the effect of 18 strains of the *Fusarium* stage of *Lisea* [*Gibberella*] *fujikuroi* [*R.A.M.*, xi, p. 400 and next abstract], isolated from rice in the Kyoto district of Japan, on the development of rice seedlings of the Nakate-Shinriki variety. All but three of the strains were obtained from seedlings showing the bakanae overgrowth phenomenon.

The action of mycelial extracts and filtrates from cultures on Knop's solution with 0·1 per cent. dextrose was in some cases

stimulatory and in others the reverse, while that of similar material from cultures containing more than 1 per cent. dextrose tended to retard the growth of the seedlings, presumably owing to the more profuse development of the fungus under the latter conditions. A single strain can produce both these effects. These results find a close parallel in the field, where the same fungus may be isolated both from apparently healthy seedlings and from those showing stunted growth and a pronounced yellow discoloration of the leaves.

SHIMADA (S.). **Further studies on the nature of the growth promoting substance excreted by the 'bakanae' fungus.**—*Ann. Phytopath. Soc. Japan*, ii, 5, pp. 442–451, 1 pl., 1932. [Japanese summary.]

A tabulated account is given of the writers' continued studies on the nature of the stimulatory substance excreted by the 'bakanae' fungus (*Gibberella fujikuroi*), and on its effect on various plants other than rice, its natural host [see preceding and next abstracts].

Extraction experiments were carried out on the following materials: (1) the filtrate of the fungus dried at gentle heat; (2) the animal black-adsorbed stimulatory principle extracted with alcohol; and (3) the same passed through a semi-permeable membrane. From (1) it was possible to extract the substance by distilled water, alcohol, ether, acetone, and chloroform, while from (2) and (3) it cannot be extracted by distilled water.

It was found that wheat, barley, maize, Azuki bean [*Phaseolus angularis*], and soy-bean seedlings placed in flasks containing the alcohol-extracted substance from the filtrate grew abnormally tall.

HEMMI (T.), SETO (F.), & IKEYA (J.). **Studies on the 'bakanae' disease of the Rice plant: II. On the infection of Rice by Lisea fujikuroi Sawada and Gibberella saubinetii (Mont.) Sacc. in the flowering period.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, Kyoto, 1, pp. 99–110, 2 figs., 1931. [Japanese, with English summary.]

The results of inoculation experiments conducted by the writers at Kyoto, Japan, showed that both *Lisea* [*Gibberella*] *fujikuroi* the agent of the 'bakanae' disease [see preceding abstracts], and *G. saubinetii* are capable of infecting rice seeds during the flowering period, the symptoms produced on the seed by both fungi being indistinguishable. Both organisms also appear to be disseminated by the seed.

Infected seeds not only show a reddish discoloration due to conidial production, but also develop brown spots over a part or the whole of their surface, the latter symptom being more constant than the former, which was mainly confined to 'blasted' or badly filled seeds. Both fungi were isolated in pure culture from the diseased seeds. Rice seedlings germinated from infected seeds of healthy aspect tend to develop the overgrowth symptoms characteristic of 'bakanae' disease, whereas those issuing from seeds with a reddish discoloration show signs of retarded growth. Apparently, therefore, *G. fujikuroi* is able to cause not only the

typical stimulatory effects but also, in severe cases, to impede normal development in the same way as *G. saubinetii*. Infection by the latter fungus was found to take place more easily in the flowering than in the milk-ripe stage.

TOCHINAI (Y.) & SHIMAMURA (M.). **Studies on the physiologic specialization in Piricularia oryzae Br. et Cav.**—*Ann. Phytopath. Soc. Japan*, ii, 5, pp. 414–441, 2 pl., 1 graph, 1932. [Japanese summary.]

The cultural characters of different collections of *Piricularia oryzae*, the causal organism of rice blast in Japan [*R.A.M.*, xi, p. 400], were found, by investigations which are described and fully tabulated, to be divergent on various nutrient media. Thus, on apricot juice agar six growth types were differentiated, on onion decoction agar four, and three each on rice plant decoction agar and peptone-sucrose synthetic agar.

Nine physiologic forms of *P. oryzae* have been distinguished on the basis of cultural differences on the above-mentioned media. On rice plant decoction agar forms I to IV grow better at 25° than at 28° C., while with VI to IX the reverse is the case. Measurements of conidial length in the different physiologic forms on steamed rice-straw showed that the conidia of forms I, II, IV, V, and IX are longer than those of III, VI, VII, and VIII, being 19·2 to 38·4 μ (mode of length 25·2 to 30·0 μ) in the former group and 13·2 to 30 μ (mode of length almost always 20·4 μ) in the latter. Moreover, the apices of the conidia were attenuated in the long group and rounded in the short one.

HEMMI (T.) & ABE (T.). **On the relation of temperature and period of continuous wetting to the infection of the Rice plant by Piricularia oryzae.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, Kyoto, 1, pp. 35–45, 1931.

The results of a series of experiments in which rice seedlings were sprayed with a spore suspension of *Piricularia oryzae* [see preceding abstract] and held in a moist chamber at various constant temperatures (20°, 24°, 28°, 32°, and 34° C.) indicated that the following minimal periods of continuous wetting are necessary to produce leaf infection: 10 hours at 32°, 8 at 28°, 6 at 24°, and 6 to 8 at 20°. At 34° infection appears to be scarcely possible. The optimum temperature for the rapid development of the initial stages of leaf infection was found to range from 24° to 28°, agreeing closely with that for the best growth of the fungus. From limited data obtained in tests with mature leaves it was evident that infection of the foliage and pedicels of the spikes can occur in fully grown plants at 20°, 24°, 28°, and 32° within six hours.

HEMMI (T.) & ENDO (S.). **Studies on Sclerotium diseases of the Rice plant. III. Some experiments on the sclerotial formation and the pathogenicity of certain fungi causing Sclerotium diseases of the Rice plant.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, Kyoto, 1, pp. 111–125, 1 fig., 1931. [Japanese, with English summary.]

The sclerotia of *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, x,

p. 815] were found to be formed more abundantly in the presence than in the absence of light. A sudden temporary fall of temperature appeared to accelerate sclerotial formation in *C. sasakii*, *Sclerotium oryzae-sativae*, and Sakurai's *Sclerotium* No. 2 [ibid., x, p. 269]. On the other hand, sclerotial production in *H. centrifugus* [*C. centrifugum*] seems to be stimulated by a sudden temporary rise of temperature, as well as by temporary submersion of the mycelium. The sclerotia of the latter organism are formed more profusely in mixed than in single cultures. The pathogenicity of *S.* No. 2 towards rice seedlings is apparently weaker as a rule than that of *S.* No. 3 and *S. oryzae-sativae.*

PF[ÄLTZER (A.)]. **Een bastinsterving bij Hevea-oculaties.** [A die-back of the bark of *Hevea* bud grafts.]—*De Bergcultures*, vi, 11, pp. 287–288, 1932.

Hevea rubber bud grafts ($1\frac{1}{2}$ to 2 years old) on a West Java estate developed, at the end of 1930, a peculiar die-back of the bark [*R.A.M.*, xi, p. 202] which appears to be very similar to the 'collar disease' since described from Indo-China [ibid., xi, p. 432]. Most of the affected plants in Java outgrew the symptoms and formed callus round the wounds.

SALMON (E. S.) & WARE (W. M.). **The chlorotic disease of the Hop. II.**—*Ann. of Appl. Biol.*, xix, 1, pp. 6–15, 1932.

In this paper the authors describe in some detail the results at the end of 1930 of the experiments started in 1927 in the transmission of the chlorotic disease of hops recently recorded by them [*R.A.M.*, ix, p. 742]. With one exception [details of which are given], no symptoms of the disease appeared until the year following that in which the inoculations were made. The disease was successfully transmitted six times by grafting, eleven times by budding, and four times by rubbing juice from infected plants on wounded surfaces of healthy ones. This feature clearly distinguishes the chlorotic disease from the other two virus diseases of the hop, mosaic and nettlehead, which, so far as is known, are only transmissible by grafting. The general inference drawn from this work is that the chlorotic disease of the hop may probably be spread by human agency during cultural operations, e.g., the stripping of the bines of their lower leaves, and possibly also by pruning implements.

AGEE (H. P.). **Report of the Committee in charge of the Experiment Station of the Hawaiian Sugar Planters' Association for the year ending September, 1931.**—Abs. in *Internat. Sugar Journ.*, xxxiv, 399, pp. 101–102, 1932.

Mosaic disease of sugar-cane is still present but is declining in Hawaii; its effects are, however, sometimes serious, and unremitting attention remains essential. Leaf scald [*Bacterium albilineans*: *R.A.M.*, xi, p. 328] was definitely found during the period under review in Hawaii on sixteen different varieties of sugar-cane and was noted in all the islands except Maui. A

correlation was established between brown stripe [*Helminthosporium stenospilum*: ibid., x, p. 777] and phosphate deficiency, increased applications of phosphate reducing the incidence of the disease. After investigation of the Java hot water treatment of cane cuttings (20 minutes at 52° C.) [ibid., vi, p. 438], the quarantine committee recommends its adoption when canes are sent from place to place.

Carpenter's work on root rot [*Pythium aphanidermatum*: ibid., viii, p. 739; ix, p. 681] tends to confirm the view that there are two classes of cane growth failure, viz., faulty soils and the root rot provoked by the fungus in certain varieties as a result of excessive nitrogen. Sugar-cane cuttings sown in sterilized soils have very different roots from those grown in unsterilized ones; thus, a heavy mass of superfine roots was observed in water cultures and in cuttings grown in soil sterilized by various methods, but cuttings grown in raw soil showed none. The cause of this is being investigated.

The origin of chlorotic streak disease remains unsolved, though control methods are known.

DAVIS (R. L.). **Sugar Cane seedling mosaic elimination.**—*Trans. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 5, p. 219, 1932.]

Experiments were conducted in Porto Rico to determine the optimum spacing and planting methods for obtaining data on the reaction of sugar-cane seedlings to mosaic. The seedlings to be tested were interplanted with infected P.O.J. 36 cane. It was found that at Mayaguez mosaic will spread in eight months for a distance of 50 ft. along a single row of a susceptible variety.

DAVIS (R. L.). **Sugar Cane crosses with Kassoer selfs.**—*Trans. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 5, p. 218, 1932.]

Inbred seedlings of Kassoer, U.S. 429, U.S. 541, U.S. 710, and U.S. 785 sugar-canes are stated to have proved almost or quite immune from mosaic and highly resistant to root rot [in Porto Rico: *R.A.M.*, vi, pp. 148, 536]. In some instances crosses between P.O.J. 2725 and U.S. 541 and 785 produced seedlings more resistant to mosaic than P.O.J. 2634 progenies. It would appear that the inbreeding of Kassoer seedlings may give rise to new varieties at once highly resistant and very productive.

Notes on new Sugar Cane varieties now free from quarantine restrictions. (By the Cane Cultivation Committee.)—*South African Sugar Journ.*, xvi, 3, pp. 169, 171, 1932.

The CH. 64/21 sugar-cane variety, produced in Cuba by crossing Uba and D. 74, has been found susceptible to streak in South Africa [*R.A.M.*, xi, p. 67]. The P.O.J. 2714, 2725, 2727, and 2878 varieties appear to be immune from streak, while Co. 290, an exceptionally useful cane of high productivity, withstands both streak and mosaic [see next abstract].

McClean (A. P. D.). **Control of mosaic disease in South Africa.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 6, p. 260, 1932.]

Owing to the occurrence of mosaic on the widely distributed wild grass, *Setaria sulcata*, in South Africa [*R.A.M.*, viii, p. 65], the complete eradication of this disease from the country is regarded as virtually impossible. It has, however, been reduced to a minimum by the use of such immune or highly resistant varieties as P.O.J. 2878, 2727, 2725, and 2714, Co. 290, and C.H. 64/21, and future releases the Mount Edgecombe Experiment Station will be limited to varieties with similar characteristics.

Ciferri (R.). **Measuring the intensity of discoloration of Sugar Cane leaves.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 6, p. 260, 1932.]

The Moll nephelo-absorptimeter has been used for the determination of the discoloration of sugar-cane leaves, such as occurs with mosaic. The apparatus consists of two sensitive thermopiles illuminated by a constant small electric light bulb. Light is passed through a healthy cane leaf and falls on one thermopile, while a parallel beam traverses a diseased leaf of the same plant and falls on the other thermopile; differences in the amount of light are measured by galvanometer deflections. Measurements on the susceptible Cristalina variety showed that the opacity of infected leaf tissue is about 27 per cent. greater than that of the healthy foliage and that it remains practically constant during the course of the disease.

Ciferri (R.). **Thickness of mottled and healthy Sugar Cane leaves.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 6, p. 260, 1932].

The writer made 17,620 micrometric measurements, with galvanometric control, of the thickness of mottled and healthy leaves of four mosaic-susceptible sugar-cane varieties. The mottled leaves were found to be generally very slightly thicker than the healthy ones, apparently due to the greater turgidity of the former, although the differences are close to the limit of error.

North (D. S.). **Testing for resistance to gumming.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 6, p. 260, 1932.]

There are a number of sugar-cane varieties in New South Wales possessing a high degree of resistance to gumming disease [*Bacterium vascularum*: *R.A.M.*, xi, p. 327], but their commercial yields are not altogether satisfactory. The quasi-immune P.O.J. 2878 shows intense susceptibility to Fiji disease, while B.H. 10(12) and S.C. 12/4, though resistant to gumming, give disappointing results under local conditions. Breeding work giving promise of success is being conducted with crosses between P.O.J. 2364 or 2878

on the one hand, and Badila, M.1900, O.813, Oramboo, and Korpi on the other.

A method of determining gumming resistance has been devised in which the varieties under test are planted in small plots and surrounded by a fringe of a susceptible but tolerant variety, e.g., Innes 131, one shoot in each stool of which is inoculated at the age of two to four months. The results are observed as the plants reach maturity.

COOK (M. T.). **Gummosis of Sugar Cane.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists,* 1932. [Abs. in *Facts about Sugar,* xxvii, pp. 260–261, 1932.]

The strains of *Bacterium vascularum,* the causal organism of sugar-cane gummosis, occurring, respectively, in Porto Rico and Australia [*R.A.M.,* x, p. 128 and preceding abstract] are regarded as quite distinct, and it is thought probable that still other strains may exist. This assumption is based on the variable characteristics of the disease as well as on the morphological and cultural differences between the two above-mentioned strains. Thus, the colour of the gum may range from clear or opaque white through yellow and orange to black. External leaf symptoms have been found unreliable as diagnostic characters, being absent from some infected canes and occurring on others that show no internal gumming or discoloration. The only absolutely reliable symptom is the presence of gum in the fibro-vascular bundles.

COTTRELL-DORMER (W.). **Losses due to red stripe disease of Sugar Cane in Queensland.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists,* 1932. [Abs. in *Facts about Sugar,* xxvii, 6, p. 261, 1932.]

A field count of cane stalks killed by the red stripe disease (*Phytomonas rubrilineans*) [*R.A.M.,* x, 339 ; xi, p. 473] in a certain field in Queensland showed a loss of 21 per cent.

COOK (M. T.). **Rotting of Seed Cane cuttings in Porto Rico.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists,* 1932. [Abs. in *Facts about Sugar,* xxvii, 6, pp. 259–260, 1932.]

Poor germination of seed cane was a frequent cause of complaint in Porto Rico in 1928, especially in cold, wet, clay soils, where *Thielaviopsis* [*Ceratostomella*] *paradoxa* was responsible for heavy damage [*R.A.M.,* x, p. 777]. When the hard outer part of affected setts is cut through and the sett broken the fibro-vascular bundles can be pulled out like the hairs of a brush, as they decay more slowly than the ground parenchyma. *C. paradoxa* is most injurious during the cooler season and at high elevations where the temperature is relatively low even in the summer. Short seed pieces are usually destroyed more rapidly than longer ones of corresponding ages. Good control has been obtained by dipping the cut ends of short seed pieces in Bordeaux mixture, paraffin, or tar.

ABBOTT (E. V.). **Seed rots of Sugar Cane in Louisiana.**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar* xxvii, 6, p. 259, 1932.]

Rotting of seed cane pieces has recently assumed serious proportions in Louisiana where the sudden decline of the important P.O.J. 213 variety has been found to be largely due to infection by *Colletotrichum falcatum*, while *Melanconium sacchari* [see next abstract] is present to a much smaller extent. A purple species of *Fusarium* has also been observed in constant association with the diseased cuttings. The C.P. 803 variety is the most susceptible to this type of rotting, followed by P.O.J. 213, 36 and 36M, Co. 281, and P.O.J. 234 [cf. *R.A.M.*, xi, p. 75].

COOK (M. T.). **Melanconium sacchari, parasite or saprophyte?**—*Proc. Fourth Congress Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 6, p. 261, 1932.]

The writer's investigations [in Porto Rico] have led to the conclusion that *Melanconium sacchari* [*R.A.M.*, ix, p. 809] is either a saprophyte or at most a very weak parasite, the association of which with the rind disease of sugar-cane is mostly secondary.

STAKMAN (E. C.). **Die Bedeutung eines Pflanzenschutzgesetzes für die europäischen Länder.** [The importance of a plant protection law for the European countries.]—Reprinted from *Mitt. Deutsch. Landw.-Gesellsch.*, [xlvi], 6 pp., 1931.

Illustrating his observations with references to some of the most important and destructive plant diseases and pests, the writer emphasizes the urgent need for stringent quarantine measures in every country and pleads for greater attention to the interests of the community on the part of private individuals, who are too often responsible for the spread of infectious material that may result in incalculable loss to an entire nation.

United States Department of Agriculture Plant Quarantine and Control Administration, October–December, 1931.—pp. 137–170, 4 maps, 1932.

UNITED STATES.

A map is given, in connexion with the revision of the phony peach quarantine regulations (pp. 149–153) [*R.A.M.*, xi, p. 416], showing the areas regulated on account of this disease.

BRITISH ISLES.

A compilation, based on the texts of the Destructive Insects and Pests Orders of 1922 and subsequent years, is given of the plant quarantine restrictions obtaining in England and Wales, Scotland, Northern Ireland, the Channel Islands (States of Jersey), and the Irish Free State. Except with the written permission of the Minister of Agriculture, no living specimen of the following may be landed or sold: black knot of plum and cherry (*Plowrightia morbosa*) [*Dibotryon morbosum*], fire or pear blight (*Bacillus amylovorus*), chestnut canker (*Endothia parasitica*), wart disease of potato (*Synchytrium endobioticum*), onion and leek smut (*Urocystis cepulae*), and downy mildew of hops (*Peronoplasmopara*

[*Pseudoperonospora*] *humuli*). Potato consignments must be accompanied by a certificate stating that no case of wart disease has occurred on the farm or holding of origin or within 500 yards thereof. In order to prevent the introduction of elm pests, including *Graphium ulmi* [ibid., xi, p. 336] and *Micrococcus ulmi* [ibid, viii, p. 343], the landing of elms in England and Wales is prohibited from any European country except Scotland, Ireland, the Channel Islands, and the Isle of Man. With regard to elms the same restrictions apply in Scotland, while in Northern Ireland and the Irish Free State no living elm trees may be imported from any country outside Ireland. The importation into the Channel Islands of all potato varieties susceptible to wart disease is prohibited from all sources including France (as from 7th August, 1931) while in the case of non-susceptible varieties it is permitted subject to certification as indicated above.

United States Department of Agriculture. Plant quarantine and control administration. Service and regulatory announcements. List of intercepted plant pests (List of pests recorded during the period January 1, 1930 to June 30, 1931, inclusive, as intercepted in, on, or with plants and plant products entering United States territory).—pp. 201–368, 1932.

Among other interceptions made by officials of the plant quarantine and control administration of the United States Department of Agriculture during the period from 1st January, 1930, to 30th June, 1931, the following may be mentioned: *Aplanobacter michiganense* on tomatoes from Mexico; *Bacterium atrofaciens* on wheat from Italy; *Bact. marginatum* on gladiolus from Australia, New Zealand, Canada (including Ontario), England, Scotland, Germany, and the Netherlands; *Ceratostomella adiposum* [*R.A.M.*, ix, p. 612] on waternuts (*Eleocharis tuberosa*) from China; *Cerebella andropogonis* on *Brachiaria* sp. and *Sorghum lanceolatum* from the Sudan; *Diplodia pueraria*e on kudzu (*Pueraria thunbergiana*) from China; and *Leptosphaeria citricola* on grapefruit from Cuba.

Canada Department of Agriculture Destructive Insect and Pest Act Advisory Board. Regulations under the Destructive Insect and Pest Act P.C. 643. Regulation No. 18 (Foreign) 1st Revision.—1 p., 1932.

On and after 29th March, 1932, all consignments of wheat (including straw, bran, and chaff) from Australia and Asia destined for importation into Canada must be accompanied by a certificate guaranteeing the absence of flag smut (*Urocystis tritici*) from the place of cultivation, and a permit must be obtained for each importation from the Secretary, Destructive Insect and Pest Act Advisory Board, Ottawa [cf. *R.A.M.*, ix, p. 416].

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TENG (S. C.). **Fungi from southwestern China.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., vii, 3–4, pp. 69–84, 1932.

Taxonomic notes are given on some fifty fungi (chiefly woody forms) collected in 1928 and 1930 in three provinces of south-western China, viz., Kwangsi, Kweichow, and Szechuan.

TENG (S. C.). **Fungi of Nanking I.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., vii, 3–4, pp. 85–127, 2 pl. (1 col.), 1932.

Taxonomic notes are given on some 240 fungi (Phycomycetes, Ascomycetes, and Basidiomycetes) recently collected in the vicinity of Nanking, China, of which four are regarded as new species and furnished with Latin and English diagnoses.

BUTLER (E. J.) & BISBY (G. R.). **The fungi of India.**—*Imper. Council of Agric. Res., Scient. Monograph* 1, xviii + 237 pp., 1 map, 1931. [Received April, 1932.]

This list of 2,351 fungi recorded from India up to 1930 has been compiled in the hope of facilitating the work of those engaged in the study of Indian mycology.

An historical sketch is followed by an account of the distribution of the fungi, supplemented by tables showing the comparative numbers of species in India, the Dutch East Indies, and Manitoba [see next abstract], those common to India and Europe, and the known distribution of the Uredinales of three northern areas of India (Kashmir Valley, Simla, and Kumaon).

Perithecial stages of 15 species of Erysiphaceae have been found in India on some 59 different hosts in 77 collections, of which 43 originated in the Himalaya, especially Kashmir, and 14 in the Indo-Gangetic Plain. In the hotter parts of the country the conidial (*Oidium*) stage predominates. The sooty moulds in the wider sense comprise 64 species, most of which occur in the damp, hot climates of the Western Peninsula from Bassein to Travancore and of Eastern Bengal, Assam, and Lower Burma.

No new species are described, but five new combinations are made to transfer species recorded under *Vermicularia* to the genus *Colletotrichum* [cf. *R.A.M.*, viii, p. 268]. These are *C. capsici* (Syd.), *C. curcumae* (Syd.) [ibid., vii, p. 678), *C. jatrophae* (Speg.), *C. punctiforme* (Niessl), and *C. zingiberis* (Sundarar.) [loc. cit.]. It is pointed out that under the International Rules of Nomenclature,

Sclerospora javanica Palm should be known as *S. maydis* (Racib.) Palm. A new name, therefore, *S. indica*, is applied to the Indian maize parasite previously incorrectly identified with Raciborski's fungus.

A bibliography of 526 titles and a host index are appended.

BISBY (G. R.), BULLER (A. H. R.), & DEARNESS (J.). **Additions to the fungus flora of Manitoba.**—*ex Eleventh Ann. Rept. Canadian Plant Disease Survey 1931*, pp. 108–116, 1932. [Mimeographed.]

The 142 additions listed in this supplement to the authors' book 'The Fungi of Manitoba' (viii + 194 pp., 1 map, London, Longmans, Green & Co., 1929) bring the known species in the region under discussion (1st November, 1931) to a total of 2,109, besides about 20 on man and the higher animals.

SIDERIS (C. P.). **Taxonomic studies in the family Pythiaceae. II. Pythium.**—*Mycologia*, xxiv, 1, pp. 14–61, 21 figs., 1932.

In this, the second paper of this series [*R.A.M.*, xi, p. 129], the author deals with the genus *Pythium*, to which he refers all the species previously included in the subgenus *Sphaerosporangium* [cf. ibid., xi, p. 330]. After a discussion of the morphological characters which he suggests as a basis for the taxonomic subdivision of the genus, he gives detailed descriptions [including Latin diagnoses of the new forms] of 19 species or varieties, among which the following, all isolated [with one exception] in the Hawaiian islands, are considered to be new. *P. allantocladon*, obtained from roots of spinach and believed to be a saprophyte; *P. ascophallon*, from the roots of spinach and *Ricinus communis*; *P. polycladon*, from the roots of *R. communis*; *P. chamaihyphon*, from the roots of papaw; *P. euthyhyphon*, from pineapple roots; *P. acanthophoron*, from the base of diseased pineapple leaves; *P. araisosporon*, from papaw roots; *P. splendens* var. *hawaiianum* n. var., a very aggressive parasite of pineapple roots, and moderately parasitic on those of the pigeon pea (*Cajanus indicus*), *Phaseolus aureus*, *Vigna sinensis*, *Vicia faba*, wheat, sweet potato, *Canavalia ensiformis*, and sunflower; *P. teratosporon*, from spinach roots; *P. irregulare* var. *hawaiiense* n. var., from pineapple roots, *P. polymorphon*, from the same host (a morphologically similar form was examined by the author from diseased tobacco roots in Kentucky); *P. artotrogus* var. *macracanthum* n. var., from pineapple roots; *P. diameson*, from pineapple roots; and *P. plerosporon*, from diseased tobacco roots in Kentucky. The paper also includes a key for the identification of the species dealt with. It is concluded that the morphological characters of the oospores and, to a certain extent, of the antheridia of all species of *Pythium* are fairly constant except for normal variations.

JACKSON (H. S.). **The rusts of South America based on the Holway collections. VI.**—*Mycologia*, xxiv, 1, pp. 62–186, 1932.

This further list of South American rusts collected by Holway [*R.A.M.*, xi, p. 404] gives descriptions of, and notes on 219 species occurring on representatives of the Verbenaceae, Labiatae,

Solanaceae (including 10 species on the genus *Solanum*), Scrophulariaceae, Bignoniaceae, Acanthaceae, Rubiaceae, Valerianaceae, Cucurbitaceae, and Carduaceae. Out of this number 115 are described as new to science, and their Latin diagnoses are appended.

SCHWEIZER (G.). **Über die Kultur von Rhytisma acerinum (Pers.).** [On the culture of *Rhytisma acerinum* (Pers.).]—*Planta*, xvi, 2, pp. 367–375, 3 figs., 1 diag., 1932.

Considerable difficulty was experienced by the writer in obtaining the perfect stage of *Rhytisma acerinum* [*R.A.M.*, viii, p. 274] in pure culture, but eventually apothecia and sclerotia developed in profusion in cultures exposed to sharp fluctuations in temperature (from ice or outdoor winter cold to room temperature). The following medium was found to be suitable: 150 gm. of coarsely ground dried maple (*Acer platanoides*) leaves, 50 gm. dried maple sawdust, 0·5 gm. potato or wheat starch, 0·5 gm. dextrose, 0·1 gm. asparagin, 0·1 gm. nitrophoska, 0·1 gm. magnesium sulphate, 0·1 gm. humic acid (Merck), and 0·1 gm. chitin. Sterilization may be effected by six days' exposure in a specially constructed vessel to the fumes of absolute alcohol, mixtures of chloroform and alcohol, formaldehyde, or toluol.

BRIEN (R. M.). **Host range of Sclerotinia sclerotiorum in New Zealand.**—*New Zealand Journ. of Agric.*, xliv, 2, pp. 127–129, 2 figs., 1932.

A list is given (showing the botanical and common names and the parts affected) of 39 plant species belonging to 12 families known to be attacked by *Sclerotinia sclerotiorum* in New Zealand, where this fungus is stated to be present on a wider range of hosts than any other species of *Sclerotinia* [*R.A.M.*, vii, p. 6].

SMITH (F. E. V.). **Sclerotium disease.**—*Journ. Jamaica Agric. Soc.*, xxxvi, 3, pp. 129–130, 1932.

In Jamaica *Sclerotium rolfsii* is very common on Irish potatoes, sweet potatoes, and tomatoes, but it can attack almost all the kinds of vegetables and flowers grown in the island; it is not, however, at all common on sugar-cane. Under greenhouse conditions the fungus may be controlled by sterilizing the soil by steam, while if it is widely prevalent in the field, the land should be left fallow for some years. In moderate-sized gardens the affected plants should be removed and burnt at the very first sign of attack. Where the disease is known to be present in the soil, Cheshunt compound [*R.A.M.*, i, p. 373] should be applied to the soil at intervals throughout the life of the crop, and any diseased plants promptly removed.

MENDOZA (J. M.). **Two new species of sooty molds from the Philippines.**—*Philipp. Journ. of Sci.*, xlvii, 2, pp. 289–291, 293, 2 pl., 1932.

Technical diagnoses are given in English of two new species of sooty moulds (Capnodiaceae) occurring in the Philippines, viz., *Scorias philippinensis* on *Ficus hauili* and *Parascorias spinosa* (cf. *Ann. Mycol.*, xxviii, p. 366, 1930) on *Smilax* sp.

S. philippinensis is characterized by a slimy, closely interwoven, straw-coloured to dark brown mycelium; stalked ovate or piriform, obtuse or acuminate, greenish-black perithecia, 100 to 159 by 82 to 130 μ; and obovate to clavate, thick-walled, aparaphysate asci, 40 to 57 by 12 to 13 μ, containing eight hyaline, cylindrical, triseptate ascospores, tapering at one end, 21 to 23 by 3 to 4 μ. Cylindrical pycnidia ranging from 40 to 528 by 13 to 26 μ are also formed.

P. spinosa is characterized by a gelatinous, amber-coloured to dark brown mycelium, furnished with blunt, coarse spines and composed of rounded or, occasionally, cylindrical cells, the former measuring 3·2 to 11·5 μ in diameter and the latter 8 to 9·6 by 3·5 to 6·4 μ; ostiolate, almost cylindrical or occasionally oval perithecia, 60 to 143 by 41 to 47 μ; and cylindrical to clavate, thick-walled, aparaphysate asci, 47·8 to 57·5 by 15·5 to 16·5 μ, containing eight hyaline, cylindrical, uniseptate ascospores, tapering at one end, 14 to 16 by 3 to 4·3 μ.

KOOLHAAS (D. R.) & BOEDIJN (K. B.). **De 'Theeschimmel' in Nederlandsch-Indië (Voorloopige Mededeeling).** [The 'tea fungus' in the Dutch East Indies (preliminary note).]—*De Bergcultures*, vi, 12, pp. 299–303, 2 graphs, 1932.

An account is given of the so-called 'tea fungus' (consisting chiefly of *Bacterium xylinum* and *Saccharomycodes ludwigii* with various other bacteria and yeasts), the cultivation of which in a tea infusion or extract with 10 per cent. sugar is stated to produce, in two to four days, a slightly acid liquid of agreeable aromatic flavour with valuable medicinal properties extensively used in the villages in Java. Full directions are given for the preparation of this beverage.

JACOBSON (H. G. M.) & SWANBACK (T. R.). **Manganese content of certain Connecticut soils and its relation to the growth of Tobacco.**—*Journ. Amer. Soc. Agron.*, xxiv, 3, pp. 237–245, 1932.

Observations and experiments in Connecticut have shown that a high amount of active manganese in a soil is toxic to tobacco, resulting in the production of plants with definite abnormalities. Manganese toxicity symptoms occurred in plants grown in solution cultures when the concentration of manganese was as low as 1 p.p.m. The first symptom of the injury was a yellowing of the top leaves, the discoloration being minutely distributed in the interspaces of the finest ramifications of the leaf veins and most pronounced towards the tip of the leaf. In the later stages of growth the entire leaf assumed a more yellow colour, but the 'pattern' remained the same. Later still, some of the leaves developed crinkled and brown, irregular spots. Tobacco plants grown in sand cultures showed pathological symptoms at an early stage following the admixture of 80 p.p.m. of manganese. In field tests no injury was caused by the use of manganous sulphate (486 lb. per acre), the deleterious effects of which were found to be neutralized by the presence of lime in the soil.

BALD (J. G.) & SAMUEL (G.). **Investigations on 'spotted wilt' of Tomatoes. II.**—*Australia Council Sci. & Indus. Res. Bull.* 54, 24 pp., 8 figs., 2 diags., 1931.

Further investigations conducted in Australia into spotted wilt of tomatoes [*R.A.M.*, x, p. 65] have resulted in the following additional observations on the symptoms of the disease. Under good growing conditions the check to growth caused by the disease lasts some two to three weeks. Growth is then gradually resumed, and after a few weeks there is frequently quite an appreciable amount of secondary growth, though as a rule some of the leaves are mottled and deformed. Bronzing occasionally appears on the secondary growth, especially in the field. No evidence was obtained that spotted wilt is due to a mixture of viruses.

The characteristic mottling of ripe fruit in variable but frequently concentric patterns, previously attributed by the authors to spotted wilt, could not be definitely connected with the disease by inoculation tests. Mottled fruits sometimes occur on plants showing no other definite symptoms of the disease, while diseased plants are sometimes found bearing fruit that is not mottled.

By mechanical inoculation with juice from the leaves, stems, roots, and green fruits of recently diseased tomato plants, evidence was obtained that the virus is present in all these parts, but no evidence could be found of its presence in ripe fruits. As the virus is readily destroyed by ageing and heat, it is thought possible that it may disappear in the fruit as a result of the chemical changes associated with ripening.

A description is given of an inoculation method which enables the disease to be transferred with almost unfailing success. This consists in wiping the leaves with muslin dipped in virus so that the hairs of the leaf are broken but the mesophyll tissue remains uninjured. The virus should be taken from a recently diseased tomato plant and wiped over about six leaflets of the plant which is being inoculated.

At room temperature the virus loses most of its potency within three hours and all of it within six hours. It is killed by heating for ten minutes at about 42° C. Filterability could not be determined, as filtration could not be effected before loss of potency through ageing.

Adult *Frankliniella insularis* thrips in order to transmit the disease must, apparently, have fed on an affected plant during their larval life. Under medium temperature conditions the incubation period of the virus in the larva is thought to lie probably between five and seven days.

Spotted wilt was experimentally transferred from tomatoes to tobacco and 14 other species of *Nicotiana*, as well as to 7 species of *Solanum*, *Capsicum annuum*, *Datura stramonium* [cf. ibid., x, p. 694], *Hyoscyamus niger*, *Lycium ferocissimum*, *Petunia hybrida*, *Physalis peruviana*, *Salpiglossis* sp., *Schizanthus* sp., *Aster* sp., and *Chrysanthemum* sp.

Iceland poppy (*Papaver nudicaule*), nasturtium (*Tropaeolum majus*), and *Zinnia elegans* growing in suburban gardens were found to be naturally infected with spotted wilt and were also successfully inoculated with the disease under experimental

conditions. Iceland poppies are widely grown in Adelaide during winter when no tomatoes are grown outdoors, and in some seasons were frequently found infected with the spotted wilt virus. The symptoms on the various hosts are briefly described. The authors have recently obtained evidence confirming the work of Pittman [ibid., vii, p. 410] in Australia and Smith in England [ibid., x, p. 694] in establishing that *Thrips tabaci* is also a vector of spotted wilt.

ARNAUD (G.) & BARTHELET (J.). **Recherches sur les dépérissements des arbres d'alignement.** [Researches on the dying-off of road-side trees.]—*Ann. des Epiphyties*, xvii, 4, pp. 249–323, 7 pl., 34 figs., 4 diags., 5 graphs, 1931. [Received May, 1932.]

In the first part of this paper the authors give a detailed account of their study of the disease of *Ailanthus* (chiefly *A. glandulosa*) trees in Paris, a brief notice on which has already been published [*R.A.M.*, ix, p. 735]. The trouble is now stated to have been first observed and described by Mangin in 1894 in a few isolated points of the city, from which it has very gradually but steadily spread, until now it is present in every group of these trees within the metropolitan area and in some of the suburbs. The economic importance of the disease is indicated by the fact that out of 7,400 *Ailanthus* trees which lined the thoroughfares of Paris some thirty years ago, less than 2,000 were still living at the time of the authors' survey, of which not more than a half were in good health.

Observations, supported by the authors' inoculation experiments, showed that trees of any age may be infected. The disease does not cause any visible symptom in the earlier stages, beyond a defoliation followed by death of one or two limbs of the crown, usually during the winter. Except in a few cases of inoculated young trees, no sudden wilting of the foliage was noticed. The affected trees generally perish in the second or third year after the death of the first branches, but a few may die at the end of a year. The only histological features observed in affected trees is the discoloration of the wood described in the previous paper, and the presence in its vessels and cells of the mycelium of *Verticillium dahliae* [loc. cit.], a morphological, cultural, and taxonomic account of which is given. It is pointed out that while the organism produced sclerotia freely in pure cultures and in inoculated potato plants, these bodies were rarely found in the wood of the affected *Ailanthus* trees. Details are also given of inoculation experiments which proved the pathogenicity of the fungus under controlled conditions to the sycamore (*Acer pseudoplatanus*), *Ailanthus* spp., the potato, and possibly also to apricots. Some space is given to a discussion of various hypotheses to explain the mode of entry of the causal fungus, and also of the environmental factors that favour infection, but no conclusive evidence on these points was supplied by the investigation. Control of the disease, beyond the replacement of the *Ailanthus* trees by immune species, is considered to be impracticable.

The second part of the paper briefly reviews the causes of the dying-off of elm trees in Paris, among which *Graphium ulmi* [ibid., xi, pp. 274, 275, *et passim*] does not appear to play a preponderant part, although the disease due to this fungus is widespread in France and is particularly destructive at Versailles. The disease in the avenues of elms in Paris is considered to be due chiefly to insect injury during the hottest months of the year. The elm disease now known to be due to *G. ulmi* appears to have been reported in France for the first time by Graffin (*C. R. Acad. d'Agric., Paris*, vi, pp. 23–30, 1920) and Guyot [*R.A.M.*, i, p. 334], though the former attributed it to the effects of gases used during the war.

BURGER (F. W.). **Bacterieziekte van de Wilg.** [Bacterial disease of the Willow.]—*Nederl. Boschbouw-Tijdschr.*, v, 3, pp. 75–84, 3 figs., 1932.

An account, based mainly on the investigations of W. R. Day and Miss E. J. Lindeijer, is given of the bacterial disease of willows [believed to be similar to the disease attributed to *Bacterium salicis* in England] affecting *Salix caprea, S. viminalis, S. purpurea, S. amygdalina, S. triandra,* and probably other species in Holland [*R.A.M.*, xi, p. 411].

ASHCROFT (J. M.). **Black Walnut canker caused by a Nectria.**—*Phytopath.*, xxii, 3, pp. 268–269, 1932.

Out of 104 inoculations on the wounded bark of black walnut (*Juglans nigra*) trees in West Virginia with conidia obtained from ascospores of a red *Nectria* isolated from cankers, 82 (79 per cent.) gave positive results [*R.A.M.*, xi, p. 411]. The fungus was repeatedly reisolated from these artificially induced cankers. Infection spreads more rapidly in a longitudinal direction and the lesion thus appears somewhat spindle-shaped in outline. On one- or two-year-old branches the necrotic tissue may turn dark brown. The whitish sporodochia protrude through the dead tissue, generally at the lenticels.

DEMAREE (J. B.) & COLE (J. R.). **The downy spot disease of Pecans.**—*Journ. Agric. Res.*, xliv, 2, pp. 139–146, 2 figs., 1932.

The authors state that observations since 1926 have shown that the downy spot disease of pecans (*Hicoria* [*Carya*] *pecan*) first recorded from southern Georgia [*R.A.M.*, vii, p. 254] occurs over a wide area in the south-western part of the United States, and that it is more destructive in some localities of the drier regions of Louisiana and Texas than elsewhere. It was also found that during late summer small pycnidium-like structures, 43 to 50 μ wide, form in the affected leaf tissues; these structures contain minute rod-shaped, spore-like bodies which so far have failed to germinate in water. During autumn and winter aggregated perithecia develop either in irregular rings surrounding the old downy spots or directly on the lesions, the former being distinctly larger

than the latter. The perithecia are hypophyllous, black, erumpent, ellipsoid-globose, ostiolate, and 50 to 85 μ in diameter. The eight-spored asci are clavate-cylindrical, hyaline, and measure 45 to 55 by 7·5 to 9 μ. The spores are hyaline, one-septate, the two cells being slightly unequal in size, and 12 to 15 by 3 to 5 μ. The genetic connexion of these perithecia with the conidial stage was demonstrated both in culture and by inoculation experiments. On this ground the causal fungus, which had first been tentatively identified as *Cylindrosporium caryigenum* [loc. cit.] and was subsequently transferred by von Höhnel to *Cercosporella caryigena* [ibid., iii, p. 687; x, p. 646] is now named *Mycosphaerella caryigena* comb. nov., the diagnosis of which in English in appended.

The actual damage done by the disease to pecans has not yet been established, but observations made so far indicate that, should it become destructive, it may be difficult to control, since it does not appear to be checked by the applications of monohydrated copper sulphate and lime dust used for the control of pecan scab [*Cladosporium* sp.: ibid., vi, pp. 106, 107].

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes. III.**—*Papers Michigan Acad. of Science, Arts & Letters*, xv, pp. 191–228, 10 pl., 1932.

The writer's studies on the occurrence of resupinate Polypores in the region of the Great Lakes indicated that few of them play any appreciable part in the decay of timber. *Poria subacida* is the most important of these [cf. *R.A.M.*, vi, p. 265; viii, p. 412], feather rot and windfall associated with the presence of this fungus being prevalent in almost all balsam (*Abies balsamea*) stands in the northern section of the Lake States, while other substrata for the organism include white and jack pines [*Pinus strobus* and *P. banksiana*], birch, tamarack [*Larix americana*], spruce, hemlock [*Tsuga* spp.], and black ash [*Fraxinus nigra*].

A key to the species of *Poria* (excluding the brown ones) in the Great Lakes region is included, together with a list of Polyporaceae (mainly *Poria* spp.) new to, or little known in, the districts under observation.

HEMMI (T.) & KURATA (S.). **Pathological studies on Polyporus betulinus (Bull.) Fr.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, Kyoto, 1, pp. 206–224, 2 pl., 3 figs., 1931. [Japanese, with English summary.]

The decay of birches caused by *Polyporus betulinus* [*R.A.M.*, viii, p. 745] in Japan starts from the sapwood and advances inwards very irregularly, so that, while the heartwood is attacked, portions of the sapwood remain sound. The rotted wood becomes soft and light, crumbling readily to a brown powder. Pure cultures of the fungus were grown on apricot decoction, dilute Japanese soy with onion decoction, and a number of other media, mycelial growth being generally more vigorous on agar than on liquids. The loose aerial mycelium gradually turned from white to light brown. By microchemical tests and cultural experiments (using Bavendamm's method) [ibid., vii, p. 68; viii, p. 281], the writers

classified the fungus as belonging to the cellulose-dissolving group. The minimum, optimum, and maximum temperatures for mycelial growth were found to be about 5°, 28°, and 36° C., respectively. Contact between cultures of *P. betulinus* and those of any other wood-rotting fungi in the presence of light usually resulted in the overgrowth of the latter by the former.

POMERLEAU (R.). **Distribution da la rouille vésiculeuse du Pin blanc dans la province de Québec.** [Distribution of blister rust on White Pine in the province of Quebec.]—*ex Eleventh Ann. Rept. Canadian Plant Disease Survey 1931*, pp. 105–107, 1 map, 1932. [Mimeographed.]

Blister rust (*Cronartium ribicola*) of white pines [*Pinus strobus*] was found in almost all the 35- to 100-year-old plantings, covering an area of 107,604 acres, inspected in the province of Quebec during 1931 [cf. *R.A.M.*, v, p. 526; ix, p. 420]. In some areas nearly 20 per cent. of the trees bore one or more cankers, the average incidence of infection being 1 to 7 per cent. The age of the cankers varies from 3 to 7 years, the majority dating from 1926–7. The predominant species of *Ribes* is undoubtedly *R. glandulosum* [ibid., vii, p. 349], on which the rust is practically always present, followed by *R. cynosbati* [ibid., ii, p. 4], *R. triste* [ibid., viii, p. 413] var. *albinervum*, *R. lacustre* [ibid., vii, p. 349; x, p. 698], and *R. americanum*, all of which are susceptible. Black currants (*R. nigrum*), which are extensively cultivated in Quebec, are an important source of blister rust infection.

In a plantation belonging to the Canadian International Paper Company, where 50 per cent. of the white pines were infected by blister rust, an attempt was made to eradicate the *Ribes* bushes, numbering 600 to 800 per acre, but the expense of the work was found to be prohibitive. Similar operations have, however, been conducted in other plantations on a smaller scale, with the result that 8,860 *Ribes* bushes have been eradicated, an average of 2·28 per acre.

DUFRÉNOY (J.). **L'inégale susceptibilité des Épiceas vis-à-vis du Chrysomyxa rhododendri.** [The unequal susceptibility of Spruces towards *Chrysomyxa rhododendri*.]—*Comptes rendus Soc. de Biol.*, cix, 5, pp. 352–353, 1 fig., 1932.

Spruces in the valley of Barèges, French Pyrenees, situated at an altitude between 1,300 and 1,500 m. above sea level, are stated to be liable to extensive infection by the *Peridermium* stage of *Chrysomyxa rhododendri*, the uredo and teleutospore stage of which occurs on rhododendrons in the same locality [*R.A.M.*, vii, p. 686]. Marked differences in varietal susceptibility are shown by the diseased spruces. In those contracting severe infection the parenchymatous cells of the needles, which are penetrated by haustoria, contain numerous mitochondria and are full of amyloplasts, occupied by several large grains of starch and many small fat globules, while in the more resistant varieties large vacuoles filled with precipitates of phenolic compounds largely replace the amyloplasts.

SCHWALBE (C. G.). **Studien zur Holzkonservierung. II.** [Studies on wood preservation. II.]—*Angew. Chemie*, xlv, 11, pp. 223–227, 1932.

Continuing his investigations on wood preservation [*R.A.M.*, vi, p. 647], the writer found that spruce and pine heartwood is not completely permeated by sodium fluoride immediately after impregnation by pressure, if in the 'green' state. After three years, however, a considerable portion of the disinfectant was found to have penetrated to the centre of the heartwood. Mycological tests by Dr. [J.] Liese at the Eberswalde Forestry College showed that this method affords entire security against fungous infection. The amount of sodium fluoride required for the 'green' treatment is considerably below the 2 per cent. necessary for 'dry' impregnation. Probably the sodium fluoride, besides being toxic to wood-destroying fungi, enhances the firmness and durability of the wood by coagulating the colloidal membranes.

DAWSON (MARION L.). **A study of some vegetable rots occurring in Evanston markets.**—*Trans. Illinois State Acad. Sci.*, xxiii, 3, pp. 131–142, 1 fig., 1931.

In the course of a survey made during the autumn and winter of 1927–8 of the fungous rots of vegetables in the Evanston (Illinois) markets a number of rot-producing fungi, chiefly Mucoraceae and species of *Fusarium*, were recorded for the first time on the hosts in question.

The onion rot caused by *Penicillium gliocladium-clonostachys* was characterized by soft, water soaked areas, which rapidly enlarged and became covered by a white mycelium and later by creamy-white, powdery spore masses. On Blakeslee's agar the fungus produced white colonies tinged with buff. The conidiophores, 24 to 25 μ long, arising from coremial fructifications, bear elliptical, pale green conidia, 4·2 to 4·8 by 2·1 to 3·3 μ.

Inoculation experiments with *Rhizopus arrhizus* [*R.A.M.*, ix, p. 611; x, p. 426], which occurred on pumpkins, gave positive results on tomato, cucumber, sweet potato, eggplant, onion, swede, carrot, squash, pumpkin, green bean [*Phaseolus vulgaris*], and pepper [*Capsicum annuum*]. The decay of eggplant, cucumber, tomato, and other vegetables caused by *R. fusiformis*, isolated from swedes [ibid., viii, p. 81], was noticeably slow. *R. nigricans* was isolated from onions and beans, and its variety *minor* from tomato and sweet potato. The onion strain proved particularly virulent, producing a rapid, wet rot that destroyed all the hosts inoculated in three days. The tomato strain, on the other hand, was a weak parasite. *R. nodosus* was twice isolated from eggplant, on which it behaved as a very vigorous parasite.

Mucor abundans, found on eggplant, caused severe infection on all the ten hosts inoculated (potato, sweet potato, carrot, onion, eggplant, peas, beans, asparagus, tomato, and pepper). *M. hiemalis* from peas failed to infect the first three hosts in this list, but on the others it produced similar results to the foregoing. *M. circinelloides*, found on string beans [*P. vulgaris*], attacked only peas, beans, asparagus, tomato, and pepper.

GIBBS (J. G.). **Control of club-root. Experiments with lime and fertilizers.**—*New Zealand Journ. of Agric.*, xliv, 1, pp. 28–32, 2 figs., 1932.

This is an abridged version of the author's recently published account of his experiments with lime and fertilizers in the control of the club root disease [*Plasmodiophora brassicae*] of cruciferous crops [*R.A.M.*, xi, p. 415].

SNYDER (W. C.). **Seed dissemination in Fusarium wilt of Pea.**—*Phytopath.*, xxii, 3, pp. 253–257, 1932.

Observations and experiments in Wisconsin with varieties of peas susceptible to wilt (*Fusarium orthoceras* var. *pisi*) [*R.A.M.*, xi, p. 86] at a soil temperature of 18° to 24° C. (the optimum for the development of the fungus) indicated that the latter is occasionally carried with seed harvested from infested land. Thus, four wilted plants were grown from 2,100 mixed seeds of the Ashford and Acme varieties, and three from 2,000 of Perfection. This mode of transmission, though comparatively rare, must yet be regarded as a potential source of primary inoculum whereby the wilt organism may be introduced into healthy soil.

MANDELSON (L. F.). **Halo blight—a bacterial disease of Beans.**—*Queensland Agric. Journ.*, xxxvii, 2, pp. 128–133, 2 figs., 1932.

The author states that recently considerable damage has been done to beans [*Phaseolus vulgaris*] in Queensland by a bacterial disease which, in some districts, practically wiped out the crop. Field and laboratory investigations have shown the trouble to be caused by *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xi, p. 418], a brief account of which is given. Control measures are also briefly discussed.

RIKER (A. J.) & RIKER (REGINA S.). **Studies on bacteria associated with the chocolate-spot disease of Broad Beans.**—*Ann. of Appl. Biol.*, xix, 1, pp. 55–64, 2 pl., 1932.

This is a somewhat fuller morphological and cultural account of the bacterium which was isolated in England from broad beans (*Vicia faba*) affected with the chocolate spot disease, and which was briefly described by the first-named author in a previous communication [*R.A.M.*, vii, p. 214]. This strain, as well as another one obtained from Paris on the same host, was shown to be vigorously pathogenic to broad beans and garden peas in the greenhouse, but since the experiments were limited in number and carried out only during one season, it is thought that further work is necessary definitely to establish the connexion between this bacterium and the disease.

Morphologically and culturally, with the exception of a few minor differences, the broad bean organism closely resembles *Pseudomonas seminum* Cayley [ibid., v, p. 469]. Histological examination of broad bean stems inoculated through punctures showed the presence of the organism inside the vessels, in the intracellular spaces, and in the cells of the invaded tissue. A non-pathogenic strain was found which corresponded in bacteriological characters with the pathogenic strains.

BURKHOLDER (W. H.). **Effect of the hydrogen-ion concentration of the soil on the growth of the Bean and its susceptibility to dry root rot.**—*Journ. Agric. Res.*, xliv, 2, pp. 175–181, 1932.

The author states that his field observations and greenhouse experiments [the results of which are presented in tabular form] indicated that in the State of New York the susceptibility of the bean (*Phaseolus vulgaris*) to dry root rot (*Fusarium martii phaseoli*) [*R.A.M.*, x, p. 161] is not affected by the hydrogen-ion concentration of the soil. The general health of the host appears also to be little affected by this factor.

MACKIE (W. W.) & ESAU (KATHERINE). **A preliminary report on resistance to curly top of Sugar Beet in Bean hybrids and varieties.**—*Phytopath.*, xxii, 3, pp. 207–216, 6 figs., 1932.

This is an expanded and fully tabulated account of the writers' investigations in California on varietal resistance to curly top of sugar beet among bean (*Phaseolus vulgaris*) hybrids and varieties, a preliminary note on which has already appeared [*R.A.M.*, xi, p. 219].

VERDEREVSKY (D.). Виды **Sclerotinia,** вызывающие кагатную гниль Сахарной Свеклы. [Species of *Sclerotinia* causing storage rot of Sugar Beet.]—*Наукові Записки з Цукрової Промисловости.* [*Sugar Industry Scient. Notes*], Kieff, ix, 16–17, pp. 247–263, 2 pl., 1932. [French summary.]

The author states that a serious winter storage rot of sugar beet in the Ukraine is caused by a species of *Sclerotinia* which differs markedly in its morphological and cultural characters from *S. libertiana* [*S. sclerotiorum*], while closely agreeing with Ramsey's description of *S. intermedia* [*R.A.M.*, iv, p. 12; v, p. 269: but cf. vii, p. 6]. Experiments [considerable details of which are given] showed that under the local conditions various strains of *S. sclerotiorum* isolated from a wide range of natural hosts were unable to attack the stored beets. On the other hand, the local strain, provisionally identified as *S. intermedia*, was shown to grow well at temperatures below 0° C. on the beets, the saccharose content of which is rapidly and completely inverted by it. In culture on moist filter paper it produced an enzyme capable of breaking down cellulose, indicating that it is able rapidly to dissolve the cell walls of the host tissue. When cultured on sugar beet it produced an abundance of oxalic acid, but it was unable to grow on substrata with an alkaline reaction. This suggests a possible means of controlling the rot by mixing slaked lime with the beets.

So far the area of dispersion of the fungus appears to be limited to the neighbourhood of the Ramogne Plant Protection Station; in view, however, of the seriousness of the losses caused by it in that region, special precautions should be taken to prevent its further spread.

DRAKE (C. J.), HARRIS (H. M.), & TATE (H. D.). **Insects as vectors of yellow dwarf of Onions.**—*Science*, N.S., lxxv, 1943, pp. 341–342, 1932.

In the insectary at Ames, Iowa, yellow dwarf of onions [*R.A.M.*,

xi, p. 420] has been transmitted to a large number of onion plants by *Aphis rumicis*, *A. maidis*, and *Rhopalosiphum prunifoliae*, as well as by the leafhopper *Cicadula sexnotata*. Observations indicate that the two first-named, which are commonly found feeding on onion leaves in the Pleasant Valley, are responsible for a large percentage of the transmitted infection. In more than 200 definite transmissions the yellow dwarf symptoms appeared seven to twelve days after the initial exposure to viruliferous aphids. Plants thus infected were successfully used for the infection of other plants. In over 100 tests during February, 1931, 91 per cent. of the caged plants showed typical yellow dwarf symptoms within twelve days. Regardless of the portion of the plant on which the aphids had been confined, the first visible sign of the disease always appeared in the new shoots, and in some of the larger onions no indications of infection ever developed in the older leaves exposed to feeding by the insects.

TEMPLE (C. E.). **Some diseases of Cantaloupe and Cucumber.**—*Trans. Peninsula Hort. Soc. 1931*, Delaware, xxi, 5, pp. 35–41, 1932.

A brief popular account is given of the chief parasitic diseases which attack melon and cucumber crops in the Delaware peninsula, among which leaf blight (*Macrosporium cucumerinum*) [*Alternaria cucumerina*: *R.A.M.*, x, p. 771] is stated to be present in all fields and to cause considerable damage unless adequate control measures are taken. The distribution of melon and cucumber mosaic is still sporadic in the region, and there was clear evidence that the further spread of the disease may be checked by the eradication of perennial weeds [ibid., vi, p. 333] in which the disease overwinters, and the destruction of all infected melon and cucumber plants as soon as they appear. Some space is given to the discussion of control measures against the diseases dealt with, including the preparation and application of Bordeaux mixture and various fungicidal dusts.

PORTER (D. R.) & MELHUS (I. E.). **The pathogenicity of Fusarium niveum (EFS) and the development of wilt resistant strains of Citrullus vulgaris (Schrad.)**—*Iowa Agric. Exper. Stat. Res. Bull.* 149, pp. 123–184 a, 12 figs., 1932.

The present acreage of watermelons in Iowa is stated to be 90 per cent. less than before wilt (*Fusarium niveum*) became a limiting factor [*R.A.M.*, xi, p. 422 and next abstract].

Comparative physiological tests made with 18 cultures of the wilt organism from Iowa, North and South Carolina, Georgia, Tennessee, West Virginia, California, Arkansas, and Mississippi showed differences in the rate of growth on artificial media, type of pigmentation, rate of starch digestion, ability to change the hydrogen-ion concentration of neutral media, general growth habit, and degree of sporulation.

Seedling rot due to *F. niveum* is more severe at a soil temperature of 16° to 18° than at 22° to 25° or 25° to 28° C., whereas seedling wilt causes heavier damage at the last-named temperature than at lower ones. The application of lime, manure, and

commercial fertilizer in varying proportions to infested soil failed to reduce infection in the Kleckley Sweet variety.

Slight differences have been observed in the relative susceptibility of edible watermelon varieties, that known as 'Japan No. 7' being the most satisfactory of those tested. The relative resistance of inedible varieties varies greatly, Preserving Citron being the most susceptible and White Seeded and Majorta the most resistant among those used in the trials. Five hybrids between Conqueror and the varieties Kleckley Sweet, Tom Watson, Halbert Honey, and Excel (all edible varieties) were more resistant than the parents in 1928 and 1929, the relative resistance in the former year of these hybrids being as follows: hybrid 30, 46 per cent.; 33, 59 per cent.; 43, 22 per cent.; 90, 35 per cent.; and 137, 55 per cent., compared with the 99 per cent. susceptible Kleckley Sweet. Two hybrids, Q21 and Q23, showed 68 and 64 per cent. resistance, respectively, in 1928 when all the above-mentioned, named, edible varieties, as well as Thurmond Grey and Dixie Belle, were almost entirely susceptible. F_2 hybrids between Preserving Citron and Tom Watson proved resistant to wilt but highly susceptible to mosaic [cf. ibid., xi, p. 349]. F_2 hybrids between White Seeded and Halbert Honey were resistant to wilt in 1927 and 1928.

MILLER (J. W.). **Progress report on the Watermelon wilt project in Illinois.**—*Trans. Illinois State Acad. Sci.*, xxiv, 2, pp. 124–129, 1931.

So far the results obtained since 1926 in Illinois in the selection of a watermelon variety resistant to wilt (*Fusarium niveum*) [see preceding abstract] are not very encouraging, but hybridization experiments have been more successful. Seven hybrid strains in the F_3 and F_4 generations between the Kansas stock melon and different commercial varieties (Halbert Honey, Tom Watson, Conqueror, and Thurmond Grey) are very promising, both as regards resistance to wilt and other desirable qualities. In 1930 these strains produced 25 to 50 per cent. of a normal crop under the most adverse conditions, whereas all the standard varieties used as controls succumbed to wilt. Resistance to *F. niveum* appears to be correlated with the presence of green colouring in the seeds, hundreds of hybrids lacking this character having proved susceptible.

BEAUMONT (A.), HODSON (W. E. H.), & STANILAND (L. N.). **Eighth Annual Report of the Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30, 1931.**—25 pp., 1932.

The following are some of the items of phytopathological interest occurring in this report. The Roscoff varieties of broccoli [*Brassica oleracea* var. *botrytis*] maintained their resistance to ring spot (*Mycosphaerella brassicicola*) [*R.A.M.*, ix, p. 230].

Fungous diseases of flowers were exceptionally severe in the spring of 1931, the losses from this cause in west Cornwall, where humidity was extremely high, being probably unprecedented. The

most serious was iris 'rust' (*Heterosporium gracile*) [*Didymellina macrospora*: ibid., ix, p. 38], which affected all varieties except the earliest, such as Wedgwood. *Ramularia macrospora* [ibid., ix, p. 623] was isolated in numerous cases from *Narcissus* [*poeticus*], chiefly from the *ornatus* varieties. *Puccinia pruni-spinosae* was very prevalent on anemones, causing failure of flowering [ibid., xi, p. 249]. The anemone crop being of much greater value in the west country than plums (the alternate host of the rust), the eradication of the latter is recommended.

All the early potato varieties grown in Devon and Cornwall are highly susceptible to blight [*Phytophthora infestans*: ibid., ix, p. 623]. Since 1929 the meteorological data determined by Dutch workers as likely to result in blight outbreaks [cf. ibid., xi, p. 123] have been summarized and applied to the conditions prevailing at Seale-Hayne. The value of the Dutch rules as indications of the likelihood of epidemics was again demonstrated during the period under review, even though infection does not occur with quite such regularity as predicted. In 1931 humidity was high (75 per cent. or above) on 14 days in May, 16 in June, 14 in July, and 16 in August, exceptionally favourable periods for the development of the fungus being from 4th to 12th June and 9th to 15th July. In 1929 and 1930 blight was much less severe and did not begin until August. In each year the critical humidity for the development of *P. infestans* appears to be over 70 per cent. for the average of the afternoon readings.

Heavy losses were caused in the older strawberry plantations of the Tamar Valley by the fruit rot due to *P. cactorum* [ibid., x, p. 435], complete control of which was obtained, however, by dressing the beds with straw before the appearance of infection. In one case where the work of strawing was left incomplete, the fruits on the side of the row where straw had been laid were perfectly healthy, while those on the other side, in contact with the soil, were nearly all rotted.

Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1929. [Diseases and pests of cultivated plants in the year 1929.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 43, 3 graphs, 30 maps, 1932.

This survey of the fungous diseases and insect pests attacking cultivated plants in Germany during 1928 is compiled on the same lines as the previous report [*R.A.M.*, x, p. 584]. The distribution of the following diseases (amongst others) is shown by means of maps: barley stripe (*Helminthosporium gramineum*), foot rots of cereals (*Ophiobolus herpotrichus, Leptosphaeria herpotrichoides, Fusarium* spp., etc.) [ibid., xi, p. 444], blackleg, late blight, and scab of potatoes (*Bacillus phytophthorus, Phytophthora infestans,* and *Actinomyces* [*scabies*: ibid., xi, p. 320]), root rot of beets (*Pythium de Baryanum, Phoma betae,* and *Aphanomyces levis*), heart and dry rot of beets [ibid., xi, p. 149], clover rot (*Sclerotinia trifoliorum*) [ibid., x, p. 669], finger-and-toe of cabbage (*Plasmodiophora brassicae*), and apple and pear scab (*Fusicladium dendriticum* and *F. pirinum*) [*Venturia inaequalis* and *V. pirina*].

UPPAL (B. N.). **India: Rhizoctonia bataticola on Sorghum. Sclerotium rolfsii on Cotton in Bombay.**—*Internat. Bull. of Plant Protect.*, vi, 3, p. 38, 1932.

Rhizoctonia bataticola [*Macrophomina phaseoli*] has been definitely shown by controlled experiments to be pathogenic to sorghum under certain conditions of soil moisture in the Bombay Presidency [*R.A.M.*, xi, p. 38]. Severe damage was caused by this fungus to the last winter sorghum crop in the experimental plots at Mohol, probably owing to the heavy rains in early December, 1931. *Sclerotium rolfsii* has been reported for the first time to be causing injury to cotton under field conditions in the Bombay Presidency.

ADAMS (J. F.). **Report of the Plant Pathologist for 1931.**—*Quart. Bull. State Board of Agric., Delaware*, xxii, 1, pp. 3–31, 5 figs., 1932.

Popular notes are given on the prevalence of plant diseases in Delaware during 1931 [cf. *R.A.M.*, x, p. 645], accompanied by tables showing (1) the comparative efficacy of various sulphur fungicides in the control of black rot of apple (*Physalospora malorum*) [*P. cydoniae*]; (2) the incidence of infection by sooty blotch (*Gloeodes pomigena*) [ibid., xi, p. 365] on Grimes and Stayman apples treated with various forms of sulphur; (3) a comparison of russeting on apples sprayed with different materials; and (4) the relative defoliation of peach trees by various spray combinations.

Contrary to the results obtained in 1930, *P. cydoniae* was held in check by copper-containing fungicides but not by sulphur sprays. The best control of *G. pomigena* was given by commercial lime-sulphur 2½ in 100, dry-mix 6 lb. and dry lime-sulphur 1 lb. in 100 galls., and kolofog 8 lb. in 100 galls. Colloidal copper (2 lb. in 100 galls.) caused the most severe russeting on Grimes, Jonathan, Stayman, and Paragon apples (33, 42·5, 34·2, and 30·1 per cent., respectively). Peach defoliation was most in evidence where lead arsenate and sulphur sprays were used.

Meeting agriculture's old and new problems with the aid of science.—*Forty-eighth Ann. Rept. Wisconsin Agric. Exper. Stat. for year ended June 30, 1931* (*Bull.* 421), 152 pp., 37 figs., 7 diags., 2 graphs, 1932.

The following are some of the items of phytopathological interest in this report additional to those already noticed from other sources. As a result of the systematic campaign against stripe disease and covered smut of barley [*Helminthosporium gramineum* and *Ustilago hordei*], the loss from these diseases in Wisconsin was only 205,000 bushels in 1931 as compared with 556,000 in 1927. An important factor contributing to this improvement has been the extended use of the stripe-resistant Wisconsin 37 and 38 varieties.

S. S. Ivanoff and A. J. Riker found that the causal organism of Stewart's wilt disease of maize (*Aplanobacter stewarti*) [*R.A.M.*, xi, p. 446] enters young plants by way of the soil through wounds. In the leaves the bacteria were found to escape from the vascular system into the surrounding tissue, where they produce long, water

soaked, pale green stripes. They were further detected in the vascular system of the tassel and in the seed, but not in the embryo. *A. stewarti* grows well with glycerine and ammonium salts as sources of carbon and nitrogen, respectively. It develops well in media with a high oxidization-reduction potential and shows exceptional tolerance for sodium chloride and sodium taurocholate. With this information a differential medium has been developed to facilitate the study of the soil relations of the wilt organism.

J. C. Walker and W. H. Pierce are making a study of the reaction of some standard bean (*Phaseolus vulgaris*) varieties to the Refugee and Robust strains of mosaic [ibid., xi, p. 417], the former being the common leaf curling and mottling virus, and the latter affecting (under natural conditions) only the Michigan Robust variety. Pronounced mottling and leaf curl, with slight dwarfing, was shown by Refugee Stringless Green Pod, Refugee Wax, Red Valentine, Dwarf Horticultural, Mahogany Red Kidney, Mexican Tree, and commercial Great Northern inoculated with the Refugee strain. Among the varieties tolerant to this strain are Improved Kidney Wax, Brittle Wax, Full Measure, Longfellow, and Giant Stringless, in which there is only a slight yellowing and thickening of the leaves. Highly resistant or immune varieties include Michigan Robust, several Great Northern strains developed at the Idaho Station, and Corbett Refugee, a selection from the commercial Refugee Stringless Green Pod. The above-mentioned susceptible varieties, on inoculation with Robust mosaic, become distinctly yellowed, brittle, dwarfed, and usually die, typical mottling being present. In resistant varieties the mottling consists of small granular interspersions of dark and pale green, accompanied in Corbett Refugee by slight leaf curl.

J. C. Walker and C. B. Sumner found that tomato leaf mould (*Cladosporium fulvum*) occurs over a wide range of greenhouse temperatures, but a high degree of moisture is essential to the development of the fungus which may be controlled, therefore, by maintaining the relative humidity below 80 per cent. [cf. ibid., x, p. 630].

Catechol, a phenolic substance (2, 3 dihydroxy benzene) detected by K. P. Link in the red and yellow scales of onions, was shown by J. C. Walker to be highly toxic to the spores of the smudge and neck rot fungi [*Colletotrichum circinans* and *Botrytis* spp. : cf. ibid., x, pp. 499, 701].

Infectious hairy root of nursery apple trees [*Bacterium rhizogenes* : ibid., xi, p. 461] was observed by E. M. Hildebrand and A. J. Riker to be spread by insects eating the galls and other underground parts. The incidence of the disease was considerably reduced by the exclusion of insects from young trees in the field. The host appears to be penetrated exclusively through wounds, and the bacteria are most abundant in the soft, outer tissues of the enlargements. The organism may exist independently in the soil for over a year.

Dudley and Northwestern Greening apples suffered from injury caused by lime-sulphur and flotation sulphur sprays in conjunction with abnormally hot summer weather, up to 20 per cent. of the fruit of the former variety being burnt after treatment on 27th June.

FAWCETT (G. L.). **Departamento de Botánica y Patología Vegetal.** [Department of Botany and Plant Pathology.]—*Rev. Indust. y Agríc. de Tucumán*, xxii, 1–2, pp. 31–34, 1932.

During 1931 *Cephalosporium sacchari* was isolated from sugar-cane setts from La Mendieta, this being the first record of its occurrence in the Argentine. The fungus is apparently confined to poorly growing canes and those damaged by insects or beaten down by wind.

Ring spot [or curly top] was formerly believed to be transmitted from diseased beets to healthy tomatoes by the insect *Agallia sticticollis* [*R.A.M.*, ix, p. 565], but recent experiments with this supposed vector under controlled conditions failed to produce the typical symptoms. On the other hand, positive results were given by tests with various other insects frequenting tomatoes, including *Myzus persicae*, *Epitrix* sp., and *Dicyphus* sp.

BUTLER (E. J.). **Les fausses analogies entre le 'crown-gall' des plantes et les tumeurs malignes des animaux.** [False analogies between 'crown gall' of plants and malignant tumours of animals.]—*Deuxième Congr. Internat. de Path. Comp.*, Paris, *II. Comptes rendus et Communications*, pp. 563–564, 1931. [Received July, 1932.]

The analogy drawn by certain investigators between crown gall of plants (*Bacterium tumefaciens*) and animal cancer is based, at least in part, on the supposed existence of metastases and the development of embryomata in the former. The so-called 'metastases' of crown gall, however, have been shown by other workers [*R.A.M.*, iii, pp. 15, 386] to be due to two simple processes quite distinct from those of cancer. The first is the elongation of the site of inoculation in plants of rapid growth, accompanied by the formation of secondary galls at a considerable distance above the point of infection, and the second is the passage of the bacteria along the longitudinal intercellular cavities, causing the development of new tumours at the places of active multiplication. In neither case is there any extension of the crown gall tissue into the adjoining healthy parts. The crown gall cells themselves are formed by the division of the host cells into as many as a hundred from a single one.

The so-called 'embryomata' or leafy shoots on the surface of the gall are considered to be merely adventitious formations similar to those formed from the callus of cuttings or as a result of incompatible grafts [ibid., ix, p. 797].

In short, a study of the pathological anatomy of crown gall is not considered to justify any parallel between this disease and animal cancer [cf. ibid., x, p. 778].

HART (HELEN). **Morphologic and physiologic studies on stem-rust resistance in cereals.**—*U.S. Dept. of Agric. Tech. Bull.* 266, 76 pp., 29 figs., 1931.

In discussing and summarizing the results of investigations into the different structures responsible for the morphological resistance of wheat to stem rust (*Puccinia graminis*) and into stomatal behaviour as the principal cause of functional resistance [*R.A.M.*,

xi, p. 439], the author states that wheat seedlings offer virtually no morphological restrictions to the development of rust. In mature plants the size, shape, and disposition of the collenchyma strands in the peduncle are important factors in determining the spread of the mycelium and the size of the rust pustules. Some varieties of common wheats are characterized by very broad and coalesced strands of collenchyma, while others usually have very narrow single strands of collenchyma with strong wide bands of sclerenchyma between them. The durum and emmer wheats have extensive areas of collenchyma, consisting in the former of three to seven or more confluent strands, but usually narrower and isolated in the emmers. The width of the rust-susceptible area of the leaf blade varies in different varieties of wheat and in different species of *Triticum*, but the divergences are seldom sufficient greatly to affect the size of the rust pustules. The leaf sheath contains broad strands of rust-susceptible tissue continuous with those of the leaf blade and not differing greatly in different varieties of wheat. There is relatively little rust-susceptible tissue in the glumes and awns.

Experiments made to determine the effect of fertilizers on the structure of wheat varieties and their susceptibility to rust did not reveal any consistently significant differences in the proportion or distribution of collenchyma in the peduncles. The application to the soil of nitrogenous fertilizers did not increase the diameter of the peduncles of Marquis but did those of Kota, though it was not definitely ascertained whether rust susceptibility was thereby increased. No one fertilizer or combination of fertilizers seemed consistently to change the structure of plants sufficiently to affect their reaction to infection.

Kota wheat plants affected with smut (*Ustilago tritici*) were liable to become more heavily rusted than were originally healthy plants, apparently merely because they remained in the green and susceptible condition somewhat longer than the others.

From the facts available the author concludes that the causes of resistance in wheat to stem rust can be grouped into three general categories, protoplasmic, morphological, and functional.

A bibliography of 52 titles is appended.

DILLON WESTON (W. A. R.). **IV. Studies on the reaction of disease organisms to light. The reaction of disease organisms to certain wave-lengths in the visible and invisible spectrum. II. Reaction of urediniospores to visible light: wave-lengths between 400 and 780 $\mu\mu$.**—*Phytopath. Zeitschr.*, iv, 3, pp. 229–246, 1932.

This is an expanded and fully tabulated account of the writer's studies at the Dominion Rust Research Laboratory, Winnipeg, on the effect of light on the uredospores of wheat rust (*Puccinia graminis tritici*) [*R.A.M.*, xi, p. 166].

The germination of the uredospores of physiologic form 1 (red selection) reached its maximum under the green and blue Wratten Standard filters at a wave-length between 450 and 550 $\mu\mu$. A higher percentage of germination occurred under the green filters Nos. 61 and 58 than under Nos. 66 and 56 green, while the darker

blue filters gave higher germination counts than the light-blue ones. Similar results were obtained with white and yellow-red selections of form 1 of *P. graminis tritici*, forms 52 and 32 (grey), and forms 36, 17, 21, and 9 (red), as well as with *P. graminis avenae* and *P. coronata* [*P. lolii*]. When the uredospores of *P. graminis tritici* 1 were dusted on solutions of Congo red dye (*a*) in light (2 ft. from a 500-watt lamp) and (*b*) in darkness, no germination took place under the former conditions, while under the latter the percentage germination was 83. When light-green dye was used for the same purpose the germination percentages were 66 and 79 respectively. The germination percentages of *P. graminis avenae* on Congo red were 8 and 82 in light and darkness, respectively, the corresponding figures for light-green being 88 and 87.

The admixture of two tints producing white light, e.g., crimson and moss green or scarlet and peacock, inhibits the germination of the uredospores, the tints of the longer (yellow) wave-lengths apparently being responsible for the inhibition.

[An abridged version of this paper appears in *Scient. Agric.*, xii, 6, pp. 352–356, 1932.]

HUBERT (K.). **Beobachtungen über die Verbreitung des Gelbrostes bei künstlichen Feldinfektionen.** [Observations on the spread of yellow rust with artificial field infections.]—*Fortschr. der Landw.*, vii, 7, pp. 195–198, 2 figs., 1 diag., 1 graph., 1932.

An account is given of the successful application of Gassner's and Straib's method of artificial field infection of wheat with yellow rust (*Puccinia glumarum*) at Halle [*R.A.M.*, xi, p. 167]. Plots of the Michigan Bronze variety contracted the disease through the agency of wind-blown spores from the test selections, which were situated at a distance of 100 to 150 m. to the south-west. At the end of June, 1931, when the artificial yellow rust epidemic was supplemented by a severe natural outbreak of brown rust (*P. triticina*), the writer made two aeroplane flights for the purpose of catching spores. The bulk of the spores occurred at the lower altitudes (5,193 per slide measuring 55 by 25 sq. mm. at 30 m. and below, the corresponding figures for 400, 600, and 800 m. being 1,832, 1,222, and 235, respectively). Numerous spores of loose smut of oats [*Ustilago avenae*] were trapped on the same occasions.

FEUCHT (W.). **Die Wirkung des Steinbrandes Tilletia tritici (Bjerkander) Winter und Tilletia foetens (Berkeley et Curtis) Tulasne auf verschiedene Winterweizensorten bei künstlicher Infektion in ihrer Abhängigkeit von äusseren Faktoren.** [The effect of bunt *Tilletia tritici* (Bjerkander) Winter and *Tilletia foetens* (Berkeley & Curtis) Tulasne on different winter Wheat varieties exposed to artificial infection as conditioned by external factors.]—*Phytopath. Zeitschr.*, iv, 3, pp. 247–290, 1 fig., 3 diags., 1 graph, 1932.

Investigations at Jena University showed that moderately low air and soil temperatures at sowing time consistently lead to an increased incidence of wheat bunt (*Tilletia tritici* [*T. caries*] and

T. foetens), while both very high and very low ones tend to reduce it [cf. *R.A.M.*, x, p. 649]. For the Strube's Dickkopf variety the optimum air temperature for infection is between 5° and 6° C., with a corresponding soil temperature, but it is pointed out that other varieties react differently in this respect. Dry soils appear to favour infection by bunt under German conditions, while the preceding crop also exerts an influence on the incidence of infection, which was found to be higher after peas than after wheat. The most effective of the fertilizers used against bunt was found to be calcium cyanamide [ibid., vii, p. 500] at the rate of 6 gm. per kg., but complete freedom from infection was not obtained by this method of treatment.

In several years' varietal reaction tests with the bunt collection Jena-Zwätzen (consisting of 98 to 98·5 per cent. *T. caries* and 1·5 to 2 per cent. *T. foetens*), the only highly resistant variety was Heil's Dickkopf, while Carsten's Dickkopf V, Criewener 104, and Bensing's Trotzkopf were slightly so. Of the varieties tested once only, Hohenheimer 77, Hussar, Ridit, Martin, and White Odessa proved very resistant to the Zwätzen collection, but they were more susceptible to the Halle collection of *T. caries*. The Cosel O.-S. collection was the most virulent towards Hohenheimer 77, followed by that from Breslau.

The writer's observations do not confirm those of Potter and Coons (*Phytopath.*, viii, p. 106, 1918) that wheat ears attacked by *T. caries* present a broader appearance than those infected by *T. foetens* owing to the fact that the smut balls of the former species are thick and swollen, while those of the latter are slender. In both species of *Tilletia* the writer has found swollen as well as slender, almost elongated-oval smut balls, the shape of which seems to be determined more by the wheat variety than by any inherent tendency in the fungus.

In the Heil's Dickkopf variety the percentage of partially diseased plants following artificial inoculation with slightly virulent collections, e.g., those from Göttingen and Hohenheim, was much higher than that obtained with highly virulent bunt strains. In Dornburg wheat the reactions in this respect were completely reversed, indicating a specific varietal response to the different bunt collections. All the bunt collections except Cosel attacked the progeny of Heil's Dickkopf more severely than the original stand, so that in this variety, at any rate, a gradual weakening of the hereditary resistance to bunt must probably be expected.

BRESSMANN (E. N.). **Susceptibility and resistance of Wheat varieties to bunt.**—*Journ. Amer. Soc. Agron.*, xxiv, 4, pp. 249–255, 1 fig., 1932.

The writer tabulates and discusses the results of experiments in 1930–1 on the reaction to bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] of nearly 200 wheat varieties in Oregon. The inoculum, which was obtained in 1929 from the Hybrid 128 variety, consisted of a mixture of equal parts of the ten physiologic forms of bunt previously reported [*R.A.M.*, xi, p. 33].

An unusually large amount of infection was secured (up to 100 per cent. in nine varieties while none escaped altogether). The

most resistant varieties were found to be Quality, Ridit, Minard, Beloglina, Ashkof, Bacska, Iobred, Acme, Akrona, Arnautka, Nodak, and Velvet Don. Both Quality and Ridit showed a characteristic partial bunting of the heads, while the two smutted heads in Minard were extensively branched, a phenomenon not hitherto observed in connexion with this disease. In general, the hard red winter and durum wheats were more resistant than the spring varieties (except Quality), but no chromosome group was exempt from attack in these experiments.

ARNAUD (G.) & GAUDINEAU (Mlle). **Le traitement de la carie du Blé. III. (Action comparée des produits cupriques et du formol.)** [The treatment of Wheat bunt. III. Comparative action of copper products and formalin.]—*Ann. Agron.*, N.S., ii, 2, pp. 229–246, 2 graphs, 1932.

This is an expanded and fully tabulated account of the writers' experiments in the treatment of wheat bunt [*Tilletia caries* and *T. foetens*] in France by formalin and various copper-containing products (copper sulphate, copper oxychloride, cupric chloride, and Bordeaux mixture), the main conclusions from which have already been published [*R.A.M.*, xi, p. 442].

KÖCK (G.). **Essig als Saatgutbeizmittel?** [Vinegar as a seed-grain disinfectant?]—*Fortschr. der Landw.*, vii, 8, pp. 226–227, 1932.

In the *Spirituosenzeitung*, 9, 26th February, 1931, an account is given of experiments conducted by Wisniewski at the Botanical Institute, Vilna [Lithuania] in the control of *Ustilago panici-miliacei* on *Panicum miliaceum* [*R.A.M.*, x, p. 181] by 15 minutes' or 1 hour's immersion of the seed-grain in varying concentrations of acetic acid. The incidence of infection was found to be reduced by a 1 per cent. solution but not to the same extent as with formalin; at a strength of 3 or 4 per cent. however, acetic acid proved equally effective with formalin. Applied at concentrations of 3 and 4 per cent. acetic acid reduced the germinability of the seed-grain more than formalin where milk of lime (6 per cent.) was not used after treatment; where this precaution was taken, however, acetic acid could safely be employed at 1 to 4 per cent., the results being superior to those obtained with formalin. Wisniewski concludes that acetic acid would in all probability be equally efficacious against the smuts in general, but a preliminary test of its effects on wheat bunt (*Tilletia tritici*) [*T. caries*] gave inconclusive results.

The writer carried out some experiments at Vienna to determine the action of acetic acid on the germinability of Melker rye, Kadolz and Manitoba wheat, and Princess barley, the outcome of which indicated that considerable risk of injury to the germinative capacity of the cereals is involved in this treatment unless followed by washing with milk of lime. The latter process, however, constitutes an unnecessary complication of the ordinary routine of disinfection which would scarcely be acceptable even if acetic acid should prove unusually effective against wheat bunt.

PICHLER (F.). **Der Einfluss längerer Lagerzeit auf die Keimfähigkeit trockengebeizten Getreides.** [The influence of protracted storage on the germinability of dusted seed-grain.] —*Fortschr. der Landw.*, vii, 8, pp. 217–218, 1932.

Experiments conducted at the Vienna Plant Protection Institute to determine the action of various standard dusts on the germinability of stored wheat seed-grain [*R.A.M.*, xi, p. 361] showed that, contrary to the general opinion, dusting enhances rather than reduces the germinative capacity. The average increase in germinability, after four weeks' storage, of wheat seed-grain treated with abavit B, ceresan, kâtagel (a pure copper preparation), salvocer, and tillantin was 14·4 per cent., katagel giving the lowest and tillantin the highest figure (7·9 and 18·2 per cent., respectively). All the preparations, however, caused a decrease in germinability during the first week of storage (tillantin the least), and further tests are planned to ascertain the reason for this and other points that are still obscure.

PITTMAN (H. A.). **Take-all and similar diseases of Wheat and how to control them.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., ix, 1, pp. 131–140, 4 figs., 1932.

After stating that of recent years root rot (*Wojnowicia graminis*), foot rot (*Helminthosporium sativum*), and take-all (*Ophiobolus graminis*) [*R.A.M.*, vii, p. 370; x, p. 446] have become the most serious diseases of wheat in Western Australia, the author gives a brief popular account of the morphology and etiology of these diseases, and discusses at some length the measures for their control, which are similar for all three. Stubble burning, early and clean fallowing, the avoidance of 'dry working', rotation without pasturing, heavy dressings of superphosphate especially where there is much take-all, good drainage and good preparation of the seed-bed, and the use of good seed are the chief measures recommended.

LEUKEL (R. W.). **Factors affecting the development of loose smut in Barley and its control by dust fungicides.**—*U.S. Dept. of Agric. Tech. Bull.* 293, 19 pp., 1932.

This is a summarized account of experiments from 1920 to 1930 at the Arlington Experiment Farm at Rosslyn, Virginia, to test the efficacy of 27 [named] dust fungicides in the control of loose smut (*Ustilago nuda*) of barley. The results [which are presented in tabular form] indicated that none of the preparations was effective, except in the case of certain barley varieties, e.g., Wisconsin Pedigree No. 5 and Tennessee Winter No. 52, in which natural seed infection with the fungus appears to proceed on lines somewhat similar to those of seed infection with covered smut [*U. hordei*] and stripe disease [*Helminthosporium gramineum*]; in such varieties the more active dusts appeared to give control of loose smut, but in all the others full control was only given by the hot-water treatment.

Experiments to test the effect of environmental factors on the incidence and development of loose smut indicated that soil humidity close to the point of saturation at the time of sowing tended to inhibit somewhat the development and to favour the

control of the disease by dusts, the reverse being true for very dry soil containing just enough moisture to permit of the germination of the seed grain. Between these two extremes, however, variations in soil moisture did not appear to affect greatly either the development or the control of the smut. There was also evidence that a relatively high soil temperature before emergence of the seedlings favoured the development of the disease. The general indications were that the influence of environment is not limited to the period of germination and early growth of the host, but may extend over a considerable part of the latter's life.

Scott (R. C.). **Field experiments with manganese deficiency disease of Barley.**—*Journ. Dept. Agric. S. Australia,* xxxv, 7, pp. 771–780, 6 figs., 1 map, 1932.

The author gives a brief account of investigations and experiments since 1924 at Corny Point in the Yorke peninsula of South Australia, the results of which have definitely confirmed the fact that the failure in that region of cereal crops, and more particularly of barley, associated with the condition described by Samuel and Piper [*R.A.M.*, vii, p. 469], is due to deficiency of the soils in manganese. Considerable improvement in the stand and yield of barley in experimental plots and in fields affected with the trouble was obtained by applications of a mixed dressing, consisting of 3 cwt. manganese sulphate and 17 cwt. of superphosphate, at the rate of about 1 cwt. of the mixture per acre. Experimental results appeared to indicate that the amount of manganese sulphate could be profitably increased to 5 cwt. per ton of the mixture [cf. ibid., xi, p. 295]. Manganese dioxide, even when applied with sulphate of ammonia, was shown to be unable to supply the plants with sufficient soluble manganese. It was further shown that the mixture recommended must be drilled into the soil together with the seed grain, since, when the fertilizer was applied a few days prior to sowing, the crop practically failed, showing the usual symptoms of manganese deficiency.

Lindfors (T.). **Vilka betningsmedel lämpa sig för vårsäden?** [Which disinfectants are suitable for spring seed-grain?]—*Landtmannen Tidskr. för Landtmän,* xv, 11, pp. 219–220, 1932.

Further experiments in Sweden on the control of loose smut of oats [*Ustilago avenae*] and stripe disease of barley [*Helminthosporium gramineum*: *R.A.M.*, x, pp. 510, 511] showed that sublimatformalin (liquid) and havretillantin dust are most effective against the former disease, germisan (0·25 per cent., 30 minutes' immersion), and uspulun, tutan, and abavit B dusts being less satisfactory. Uspulun dust, however, gave the highest increase of yield in all ten experiments (average 271 kg. grain per hect.), the corresponding figures for sublimatformalin, havretillantin, germisan, tutan, and abavit B being 138, 160, 116, 146, and 88 kg. per hect., respectively.

The best control of *H. gramineum* on barley was given by uspulun dust, germisan (0·25 per cent.), and uspulun-universal, tutan and abavit B being unsuitable for this purpose. The follow-

ing increases of yield were obtained by the treatments: germisan 242 kg. per hect., uspulun-universal 306, uspulun dust 115, tutan 76, and abavit B 350. All these preparations, with the exception of sublimatformalin, are also well adapted for the disinfection of spring wheat against *Fusarium*.

SLEUMER (H. O.). **Über Sexualität und Zytologie von Ustilago zeae (Beckm.) Unger.** [On the sexuality and cytology of *Ustilago zeae* (Beckm.) Unger.]—*Zeitschr. für Bot.*, xxv, 5, pp. 209–263, 1 pl., 33 fig., 1932.

Sporidial fusion in *Ustilago zeae*, the causal organism of maize smut [*R.A.M.*, xi, p. 363], was obtained in culture in sterile water rendered slightly alkaline with caustic potash at 17° C., as well as on a medium of 3 per cent. maltose and 3 per cent. glucose at 24°. From the fusion arise binuclear exploratory hyphae, the growth of which is checked in the so-called 'tangle fusion' (the term applied by Bauch to a similar process in *U. longissima*: *Arch. für Protistenkunde*, lxx, p. 417, 1930). All the combinations of monosporidial cultures causing infection were induced to fuse under appropriate conditions, whereas the strains forming entanglements failed to produce smut galls on maize. On the basis of preliminary observations the monosporidial cultures examined by the writer were placed in six distinct sexual groups.

At first the host tissue contains a binuclear mycelium, but shortly after infection uni- and quadrinuclear hyphae also develop; at a later stage all break up into predominantly uninuclear 'nest' cells, whether diploid or haploid could not be determined by cytological investigation. The sporidia developing from such cells are haploid, a fact that admits of several interpretations. Caryogamy, hitherto accepted as a stage in the development of the young spore, could not be detected with absolute certainty. However, at some point in the life-history of *U. zeae* nuclear fusion must occur, since an analysis of the progeny of a single spore showed that a uninuclear individual contains the elements of both the sexes involved in a cross [cf. *R.A.M.*, viii, p. 715].

LEONIAN (L. H.). **The pathogenicity and the variability of Fusarium moniliforme from Corn.**—*West Virginia Agric. Exper. Stat. Bull.* 248, 16 pp., 3 figs., 3 diags., 1932.

Out of 150 isolations made from Longfellow Flint maize in West Virginia in 1927, 110 proved to be *Fusarium moniliforme* [*Gibberella moniliformis*: *R.A.M.*, x, p. 238] and 20 *F. culmorum*, while the remainder consisted of various saprophytic forms. Of the 110 cultures of *G. moniliformis*, only 23 were pathogenic in inoculation experiments, carried out largely through wounds. Seedling wilt occurred only as a sequel to inoculation at the stem base, just below ground-level. Root inoculations resulted only in localized infections. Even when freshly germinated seedlings were kept on vigorously growing colonies of the fungus in Petri dishes and transplanted into the field after infection of most of the roots, they developed into normal plants. Little or no infection occurred at temperatures above 20° to 23° C. Even the most vigorous strains

of the fungus exhibited their pathogenicity in cycles, being able at one time to infect the host, while at another, under identical conditions, they failed to do so.

Most of the strains of *G. moniliformis* were very plastic and dissociated into many forms. One monospore isolation produced no less than 50 variants, differing among themselves not only in pathogenicity but also in morphological and physiological characters. Continuous monospore selection tended to fix even the most fluctuating types, but it is considered doubtful whether the purity and fixation thus obtained are of more than relative permanence. In the writer's opinion, each isolation possesses all the potentialities of the species, even though unable to express them all at the same time. Once this view is accepted, in contradistinction to that of the absolute rigidity and immutability of species, the dissociative phenomenon is no more unusual than variability, and the determination of any genus or species that has a firm foundation is not affected by it.

Late planting (June or July) in order to avoid cool, wet soil conditions appears to be the best way of avoiding seedling losses from *G. moniliformis.*

FRIEND (W. H.) & BACH (W. J.). **Storage experiments with Texas Citrus fruit.**—*Texas Agric. Exper. Stat. Bull.* 446, 40 pp., 4 figs., 1932.

A temperature of 45° F. was found to be more satisfactory for the storage of good quality, not over-ripe grapefruit in the Lower Rio Grande Valley than lower ones (31° to 32°), which caused a marked increase in the losses from pitting (pale or brown sunken spots on the rind) and scald (a physiological breakdown of the rind). Valencia oranges, on the other hand, kept well at 32° for fairly long periods (20 weeks). The amount of loss in storage was reduced to a minimum by 'curing' the fruit (i.e., keeping it at a temperature of 70° for ten days beforehand) and the use of waxed paper wraps. Little benefit was derived from the application to the fruit of various fungicidal washes, e.g., borax (which did, however, reduce the amount of scald), sodium bicarbonate, the Brogdex process [*R.A.M.*, x, p. 452], and the Slater hypochlorite process. These methods have, nevertheless, given satisfactory results in other lots of fruit infected by the blue and green moulds (*Penicillium italicum* and *P. digitatum*), which were of no importance in these experiments. Notes are given on stem-end rot (*Diplodia natalensis*) [ibid., x, p. 777; xi, p. 508], the incidence of which is negligible at 50° or below for three or four weeks or longer, and on various minor disorders.

HAAS (A. R. C.). **Some nutritional aspects in mottle-leaf and other physiological diseases of Citrus.**—*Hilgardia*, vi, 15, pp. 483–559, 35 figs., 1932.

Further studies in California on mottle leaf and allied physiological disorders of citrus [*R.A.M.*, viii, p. 717] showed that beryllium, like lithium and boron, is highly toxic in small concentrations (0·25 p.p.m. beryllium nitrate) to Eureka lemon cuttings in water

cultures, causing a type of mottling approaching variegation. At concentrations of 5 p.p.m. and above, Washington Navel and Valencia orange cuttings, as well as those of grapefruit, developed a severe root rot and defoliation.

Valencia orange leaves receiving an inadequate supply of nitrogen for a considerable period were observed to contract a dark-green and yellow mottling when applications of calcium and sodium nitrate in normal amounts were resumed. Chlorotic Valencia orange leaves sprayed with iron-containing solutions were found to show a dark-green spot where each drop of solution concentrates as the water evaporates. It is apparent from the fact that mature chlorotic leaves have the same composition as mottled ones that a close relation exists in certain cases between mottle leaf and chlorosis.

A deficiency of soluble calcium was found to exert an immense effect on the process of potassium absorption and hence on the health of the plants. Higher percentages of sodium and potassium and lower ones of calcium were found in mottled than in healthy lemon and orange leaves. The soluble calcium as a percentage of the soluble ash is roughly constant for healthy mature citrus leaves, and is much lower in mottled than in healthy foliage. On the other hand, the insoluble calcium as a percentage of the insoluble ash is roughly constant, irrespective of whether the leaves are mottled or healthy.

[NATTRASS (R. M.).] **Citrus leaf gum spot.**—*Cyprus Agric. Journ.*, xxvii, 1, pp. 24–25, 1 fig., 1932.

Citrus leaves in Cyprus are subject to an abnormality that is frequently mistaken for an infectious disease. It takes the form of small, raised, dark-brown or black, irregular, smooth, hard pustules, caused by the impregnation of a small area of the surface cells with a hard, gum-like substance. The condition is thought to be induced by slight frost followed by bright sunshine, by certain spray materials, fumigation, or soil conditions and water relations.

FAWCETT (H. S.) & KLOTZ (L. J.). **Diseases of the Date Palm, Phoenix dactylifera.**—*California Agric. Exper. Stat. Bull.* 522, 47 pp., 23 figs., 1932.

Notes are given on the symptoms, etiology, and control of a number of diseases affecting date palms (*Phoenix dactylifera*) in California. The species of *Diplodia* responsible for the decay of leaf stalks and offshoots of the Deglet Noor and other varieties in the Coachella Valley has now been determined as distinct from *D. natalensis* [*R.A.M.*, x, pp. 655, 657], and is considered to be identical with *Macrophoma phoenicum* Sacc., the name of which is changed to *D. phoenicum* (Sacc.) n. comb. The dark bi- (occasionally tri-)-cellular spores of the latter measure 22 to 24 by 10 to 12 μ; a conspicuous distinguishing feature is the formation of abundant dark, intercalary chlamydospores, which are absent in cultures of *D. natalensis* from citrus fruits in California and Florida.

The other diseases described include 'decline' [loc. cit.]; black scorch and terminal bud rot ('medjnoon' or 'fool' disease), caused by *Ceratostomella paradoxa* [ibid., xi, p. 509]; leaf spot or smut (*Graphiola phoenicis*); brown blotch, occurring in the Salt River Valley of Arizona as well as in California, and in North Africa, Italy, and France (Riviera), and associated with a species of (?) *Phoma* with abundant pycnidia, 120 to 140 μ in diameter, and hyaline pycnospores, 5 to 3 μ; 'dry bone' [ibid., x, p. 656]; brown spot (*Helminthosporium* sp. and *Alternaria* sp.) [ibid., x, p. 657]; calyx-end rot (*Aspergillus niger* and *Citromyces ramosus*); rot of wet-cured, packed dates due to *Catenularia fuliginea* [*Torula sacchari*]; and 'black nose' [ibid., x, pp. 656, 657].

Brief observations are also made on some diseases of dates not known to occur in California.

BRAIN (C. K.). **Report of the Director of Agriculture for the year 1930.**—*Rept. Secretary, Dept. of Agric. Southern Rhodesia for the year 1930*, pp. 4–14, 1931.

It is stated in this report that the numerous small coffee plantings made along the eastern border of Southern Rhodesia in the early days of the settlement were extensively destroyed by leaf disease (*Hemileia vastatrix*). Notwithstanding these discouraging results, the interest of planters in the coffee crop has been maintained, and during the last 15 years the Department has frequently been asked to supply seed. During the latter part of 1929, a survey of the area in question was made, at the request of the Mozambique authorities, by Mr. M. D. le Poer Trench of Kenya. As a result of this investigation it was strongly recommended that the Department of Agriculture should adopt a system of registration of plantations and make periodical inspections of all farms. All neglected or abandoned coffee trees should be destroyed, as constituting a menace to neighbouring plantations, and ultimately to the whole coffee-growing area.

WALLACE (G. B.). **Coffee bean disease. Relation of Nematospora gossypii to the disease.**—*Trop. Agriculture*, ix, 4, p. 127, 1932.

The author states that since the publication of his recent paper [*R.A.M.*, x, p. 453], *Nematospora gossypii* [ibid., v, p. 390] has been found to be associated with coffee bean disease in Tanganyika, in addition to *N. coryli*. This discovery widens the range of other plants which may be possible sources of infection of coffee. The disease extends into Uganda [ibid., xi, p. 353], and an unpublished communication indicates its frequent occurrence in Kenya. Both species of *Nematospora* appear to be equally destructive to coffee berries, and it is believed that they will be found to be equally widely distributed. In giving a brief description of the main cultural characters differentiating the two species, it is stated that the difference in spore width between them on coffee has been found to be greater than that described by previous authors, *N. gossypii* having spores 1·7 μ (1·6 to 1·9 μ) and *N. coryli* 2·8 μ (2·3 to 3·1 μ)

broad. Another striking difference is the abundance of yeast cells in *N. coryli* and their absence in *N. gossypii.*

EZEKIEL (W. N.) & TAUBENHAUS (J. J.). **Leaf temperatures of Cotton plants with Phymatotrichum root rot.**—*Science,* N.S., lxxv, 1945, pp. 391–392, 1932.

Leaves from Startex cotton plants wilted by *Phymatotrichum omnivorum* [*R.A.M.*, xi, p. 370] in Texas were found, by thermometer and thermocouple measurements, to be as much as 6·5° F. warmer than air temperature, whereas those from normal plants were usually cooler. In July and September, 1930, leaves from diseased cotton plants averaged about 3° F. warmer than those of healthy ones. There can be no doubt that the raised temperature of the leaves of root rot plants is due to the decrease in the water supply, which corresponds with the usual theory of the immediate cause of death in plants suffering from this disease.

MATHUR (R. N.). **Leaf-curl of Cotton in garden Zinnias in North India.**—*Nature,* cxxix, 3265, p. 797, 1932.

Recent investigations on a virus disease of garden zinnias at Dehra Dun suggest that it is identical with leaf curl of cotton in the Sudan and transmitted by the same vector (*Bemisia gossypiperda*) [*R.A.M.*, xi, p. 238]. Pending detailed results of the studies now in progress, it was thought that the presence of this disease and its insect carrier in India should be brought to the notice of those interested in the cotton industry of the country.

PETCH (T.). **British entomogenous fungi.**—*The Naturalist, 1932,* pp. 103–108, 133–136, 167–172, 1932.

Notes are given on a large number of British entomogenous fungi collected or examined by the writer [cf. *R.A.M.*, xi, p. 299]. There are stated to be now 52 known species of entomogenous fungi (excluding the Laboulbeniaceae) in the British Isles, compared with 26 two years ago.

PETCH (T.). **British species of Hirsutella.**—*The Naturalist, 1932,* pp. 45–49, 1932.

A revision of the British species of entomogenous fungi [see preceding abstract] showed that at least two formerly classified as *Isaria* should be referred to *Hirsutella*, viz., *I. eleutheratorum* Nees on beetles and *I. floccosa* Fr. on caterpillars, which should be known, respectively, as *H. eleutheratorum* (Nees) comb. nov. and *H. subulata* Petch (the name *H. floccosa* being already appropriated by Speare) [*R.A.M.*, viii, p. 380]. English diagnoses of both species are given.

PETCH (T.). **Gibellula.**—*Ann. Mycol.*, xxx, 3–4, pp. 386–393, 1 fig., 1932.

The examination of several hundred specimens of *Gibellula* on spiders from Ceylon, the West Indies, and Europe has convinced the writer that all those hitherto described belong to one species, the alleged specific variations being apparent in any reasonable series of specimens from a given locality. The earliest name for

this species is *Isaria aranearum*, and its correct one is considered to be *G. aranearum* (Schw.) Syd. A list of synonyms, including *G. elegans* [*R.A.M.*, viii, p. 380], is given. Finally, a description is given of *G. alata* n. sp. collected on spiders in Ceylon.

MORAN (T.), SMITH (E. C.), & TOMKINS (R. G.). **The inhibition of mould growth on meat by carbon dioxide.**—*Journ. Soc. Chem. Ind.*, li, 15, pp. 114T–116T, 1932.

Studies are in progress at the Low Temperature Research Station, Cambridge, on the growth in carbon dioxide of the following moulds responsible for meat spoilage [*R.A.M.*, iii, p. 52]: *Thamnidium chaetocladioides*, *T. elegans*, *Mucor mucedo*, *Cladosporium herbarum*, *Sporotrichum carnis* [ibid., ix, p. 199], *Penicillium expansum*, and *P. anormalium*.

In tests with 1 lb. pieces of lean beef inoculated with *T. chaetocladioides* at 1° C. in gas-tight jars filled with air containing carbon dioxide in concentrations of 0 to 100 per cent., it was found that a concentration of 10 per cent. retards growth of the mould in the early stages by one-half, while at 20 per cent. its development is, for all practical purposes, completely inhibited. That this effect is specifically due to the carbon dioxide and not to diminution of the partial pressure of oxygen was shown by comparative tests in which nitrogen up to 20 per cent. was added to jars of infected meat. After 4½ days' storage the meat in the nitrogen series was, if anything, more heavily infected by *T. chaetocladioides* than that without nitrogen. Storage in carbon dioxide up to 30 per cent. was found to impair neither the appearance nor the palatability of the meat. In the case of beef fat the inhibition of growth of *T. chaetocladioides* stored in carbon dioxide (up to 20 per cent.) was also clearly evident, though less marked than on the lean surfaces.

In nutrient agar cultures kept at 0° to 20° C. in a saturated atmosphere, the growth of *T. chaetocladioides*, *M. mucedo*, and *C. herbarum* in the presence of 20 per cent. carbon dioxide ranged from one-half to one-fifth of that in the air, the inhibition being more pronounced at the lower temperatures.

Two outstanding problems are stated to require solution before these results can be applied in practice to the transport and storage of meat, namely, (1) the behaviour of yeasts and bacteria in concentrations of carbon dioxide of the order under discussion; and (2) the feasibility of maintaining the necessary atmosphere in the ship's hold or the commercial cold store.

LAXA (O.). **O nové ušlechtilé sýrařské plísni.** [Note on a new, improved mould in the preparation of cheese.]—*Bull. Czecho-Slovak. Acad. of Agric.*, viii, 4, pp. 383–384, 1932. [French translation.]

The author states that the study of the fungi associated with the maturing process of Nalžovy cheese showed that the latter owed its distinctive characters to a species of *Penicillium* morphologically similar to *P. album* but differing from it in its cultural and biochemical characters, and which he names *P. nalgiovensis*. This fungus is abundantly present in the caves where the cheese is matured, but has not been found to occur elsewhere in the locality;

it is believed that it was introduced into the country in 1885, together with the cheese manufacturing industry. *P. album* is also concerned, but to a lesser degree, in the maturation process of the local cheese, which partakes of the nature of Camembert.

POLLACCI (G.). **Sulla posizione sistematica dei miceti delle tigne (Rivendicazione).** [On the systematic position of the fungi causing ringworm. (A vindication).]—Reprinted from *Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iii, 4 pp., 1931. [Latin summary.]

In this paper the author brings forward the full evidence upon which he bases his claim that Nannizzi was the first definitely to place the Dermatomycetes among the Gymnoascaceae [*R.A.M.*, v, p. 553; x, p. 664]. He points out that as early as in 1923, in a paper which he communicated to the congress of the Società Dermosifilopatica Italiana held at Florence, he stated that his collaborator Nannizzi had succeeded in cultivating various species of *Trichophyton* and had obtained organs analogous to the peridia of the Gymnoascaceae, and differing from them only in containing pycnospores. Nannizzi further showed that *Ctenomyces serratus* as well as certain species of *Arachniotus*, *Gymnoascus*, and *Myxotrichum* when grown on the usual media gave rise to colonies identical with those of various Dermatomycetes grown in the same conditions. In 1927, Nannizzi further showed that he had obtained not only peridia and pycnospores but also asci and ascospores in cultures of *Achorion gypseum* on moulds mixed with pieces of old leather and feathers [ibid., vii, p. 169].

The statement by Langeron and Milochevitch [ibid., x, p. 242] that Nannizzi did not use pure cultures is completely refuted. Both in the earlier paper (1926) and in the study on *A. gypseum*, pure cultures on sterilized media were used except where explicitly stated, and the published photograph of *T. denticolatum* shows that the drawings were not over-schematized.

Nannizzi's statement on p. 125 of his first paper that the ringworm fungi should definitely be placed amongst the Gymnoascaceae is considered to have an adequate basis in the facts established by him and has merely been confirmed by the work of Langeron and Milochevitch.

VÁMOS (L.). **Pilze und Wasserstoffionenkonzentration.** [Fungi and hydrogen-ion concentration.]—*Dermatol. Zeitschr.*, lxiii, 5, pp. 345–350, 2 graphs, 1932.

The writer's experiments showed that *Trichophyton gypseum*, *T. rosaceum*, *T. violaceum*, *Microsporon audouini*, and *Epidermophyton inguinale* [*E. floccosum*: *R.A.M.*, xi, pp. 44, 458] grow on a solid medium between P_H 5·0 and 8·0. Cultures of *M. audouini* and *E. floccosum* grew best at P_H 6·50 to 7·20, whereas the other dermatophytes throve equally well throughout the growth range. The scalp of adults has a more acid reaction (P_H 4·50 to 5·60) than in childhood (6·16 to 6·50). Hence, one of the causes of the spontaneous healing of microsporosis after the age of puberty may be the shifting of the P_H value of the scalp in the acid direction.

KAMBAYASHI (T.). **Eine botanische Untersuchung des Microsporon furfur Robin.** [A botanical investigation of *Microsporon furfur* Robin.]—*Bot. Mag.*, Tokyo, xlvi, 544, pp. 232–238, 3 pl., 1932.

Microsporon [*Malassezia*] *furfur*, the causal organism of pityriasis versicolor [*R.A.M.*, x, p. 459; xi, p. 43], grown on Sabouraud's glucose-peptone agar, produces yellowish-white, grey-tinged colonies. The hyphae are irregularly curved, tapering towards the apex, and measure 2·4 to 3·5 μ in breadth; they branch profusely in older cultures, forming conidiophores from which are abstricted, singly or in chains, hyaline, round or elongated-oval conidia, 3 to 6 by 4 μ; these bodies may also arise direct from the hyphae. Pending further studies on the systematic position of *M. furfur*, the present classification of which is not accepted by the writer, the fungus should be regarded as standing very close to *Sporotrichum*, though it cannot yet be definitely transferred to this genus.

CATANEI (A.). **Résultats de l'étude expérimentale de Trichophyton langeroni S. Milochevitch 1931.** [Results of the experimental study of *Trichophyton langeroni* S. Milochevitch 1931.]—*Comptes rendus Soc. de Biol.*, cix, 13, pp. 1160–1161, 1932.

Trichophyton langeroni, recently isolated by Milochevitch from a ringworm of the scalp of a child in Belgrade, Jugo-Slavia [*R.A.M.*, xi, p. 181], was successfully inoculated by the writer into four guinea-pigs, two Algerian monkeys (*Macacus inuus*), and two calves. The upper part of the hairs infected by the fungus contains a small number of septate hyphae, 4 μ wide; the middle portion is chiefly occupied by endothrix hyphae of the same type, which further occur in still larger numbers at the base. The infected hair is surrounded by a loose network of ectothrix elements, rounded or ovoid, the former shape predominating in the monkey; these bodies measure 3 to 6·5 μ (up to 8 μ in the ovoid forms).

ASCHIERI (EUGENIA). **Ricerche sistematiche e fisiologiche su un Hyalopus causa di onicomicosi.** [Systematic and physiological researches on a *Hyalopus* causing onychomycosis.]—Reprinted from *Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iii, 19 pp., 8 figs., 1931. [Latin summary.]

From a lesion on the finger-nail of a female patient a fungus was isolated which Vuillemin, by reason of the peculiar curvature of the 1- or 2-septate conidia, identified as an *Allantospora* and named *A. onychophila*, but which the author regards as a *Hyalopus* and renames *H. onychophilus* (Vuillemin) Aschieri, because of the presence of heads at the hyphal extremities and of the manner of formation of the conidia, which also were not constantly elongated and curved. The sterile hyphae were hyaline, septate, and up to 4·5 μ in diameter; the conidiophores measured 1·5 to 2·5 μ in diameter, were simple or branched, sometimes septate, and terminated in heads formed by elongated or oval, sometimes curved conidia 4 to 18 μ in length. Intercalary chlamydospores were formed in chains of two or three or more. The optimum tempera-

ture for growth was 25° C. Prolonged exposure to ultra-violet rays retarded growth and altered the shape of the conidia, which tended to shorten and become globose.

AGOSTINI (ANGELA). **Coniosporium onychophilum n. sp. causa di onicomicosi.** [*Coniosporium onychophilum* n. sp. a cause of onychomycosis.]—Reprinted from *Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iii, 8 pp., 5 figs., 1931. [Latin summary.]

In this paper, a preliminary summary of which has already been noticed from another source [*R.A.M.*, xi, p. 45], the author briefly describes the morphological and physiological characters of the fungus isolated from the finger- and toe-nails of a male patient in Italy, and named *Coniosporium onychophilum* n. sp.

On Pollacci's medium, glucose, potato, and carrot the organism formed flocculent, downy, extensive colonies which were white at first, but later turned pink on the surface and hazel underneath. The mycelium consisted of hyphae 2 to 2·5 μ and others 6 to 7·5 μ in diameter; the former were sparsely branched, irregularly septate, and occasionally yellowish-brown, and the latter regularly septate and always showing the brown coloration.

Conidial production, which was exceedingly rapid and profuse, took place with the formation of continuous, usually hyaline, simple or occasionally branched conidiophores (generally on the thicker hyphae), measuring 4 to 38 by 4 to 6 μ. The conidia, which were borne at the apex, were hyaline, but quickly turned brown, and were sessile or almost so. They were lentiform, measured 8 to 12 by 4 to 5 μ, had a fuliginous or olivaceous epispore, and were surrounded by a light rim. Ellipsoidal conidia measuring 10 to 12 by 5 to 7 μ were also observed, as well as oval, curved, reniform, or claviform endoconidia up to 20 μ long. A Latin diagnosis is given.

AGOSTINI (ANGELA). **Ricerche biologiche sull'Acrostalagmus cinnabarinus Corda.** [Biological researches on *Acrostalagmus cinnabarinus* Corda.]—Reprinted from *Atti Ist. Bot. Univ. di Pavia*, Ser. IV, iii, 8 pp., 1931. [Latin summary.]

A morphological and biological account is given of *Acrostalagmus cinnabarinus* isolated from the mammary gland of a mare in Africa and from a trichophytosis of the scalp of a male patient in Italy [*R.A.M.*, xi, p. 458].

On carrot and on wheat grain the fungus grew well, and retained its known morphological characters. On Pollacci's and Sabouraud's media, glucose broth, potato, milk, and hair it showed in addition to the morphological characters described by Corda, a thin, hyaline mycelium frequently with racket-shaped hyphae arranged in synnemata. In Raulin's liquid it grew with difficulty, showing morphological characters different from those developed on other media, the hyphae mostly measuring 2 to 3 μ in diameter, and being very regular, unbranched, and often arranged in synnemata: verticillate conidiophores were very seldom observed, and some of the spores were round, measuring 2 to 3 μ in diameter. On blood agar the mycelium was usually hyaline or faintly yellowish, some hyphae measuring 1·5 to 2·5 μ, and others, more or less regularly

septate, 6 to 7 μ, in diameter. The racket-shaped tips reach 15 μ in breadth. Most of the conidiophores showed only two verticils, but sometimes there was only one or even none, the conidiophore having a single cluster of spores attached to its tip. The optimum temperature for growth was between 20° and 25° C.; the fungus coagulated milk but did not break down glucose, maltose, or galactose.

Tests of pathogenicity on laboratory animals gave negative results. A bibliography of 13 titles is appended.

MAFFEI (L.). **Micosi causata da una varietà di Halobyssus moniliformis Zukal.** [A mycosis caused by a variety of *Halobyssus moniliformis* Zukal.]—Reprinted from *Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, iii, 10 pp., 10 figs., 1931. [Latin summary.]

From a ten-year-old lesion on the wrist of a male patient a fungus was isolated which in culture produced hyaline, branched, septate hyphae measuring 1 to 5 μ in diameter. Chains of chlamydospores are formed at the apex or in other parts of the hyphae, the chains at the apex having a very characteristic clavate appearance. It was nearly a year before the author observed these chains to break up. The chlamydospores ranged from 4 to 14 μ (average 10 to 12 μ) in diameter, and were round, spherical, and provided with a tough membrane; some were smooth, others verrucose or with a granular membrane.

The author considers that the fungus is a variety of *Halobyssus moniliformis* Zukal, which he names *H. moniliformis* Zukal var. *parasiticus* Maffei. It has not previously been recorded on man. A diagnosis is given in Latin.

DIDDENS (HARMANNA A.). **Untersuchungen über den Flachsbrand (verursacht durch Pythium megalacanthum de Bary).** [Investigations on Flax scorch (caused by *Pythium megalacanthum* de Bary).]—*Phytopath. Zeitschr.*, iv, 3, pp. 291–313, 5 figs., 1932.

This is a condensed account of the writer's studies on flax 'scorch' (*Pythium megalacanthum*) in Holland, the full paper on which has already been noticed [*R.A.M.*, x, p. 731].

ROLET (A.). **La rouille orangée des Rosiers.** [The orange rust of Rose trees.]—*La Vie Agric. et Rurale*, xxi, 14, pp. 223–224, 1932.

A popular note is given on the life-history, symptoms, and control of orange rust of roses (*Phragmidium subcorticium* or *P. mucronatum*) [*R.A.M.*, x, p. 524] in the south of France, where the climbing varieties, Noisette and Rugueux du Japon, and those used for scent, Brünner and Rosier de mai, are stated to be particularly susceptible, while tea roses appear to be highly resistant. Sanitary measures, disinfection of frames and soil, and regular applications of a standard fungicide are recommended.

MCWHORTER (F. P.). **Narcissus 'gray disease' is a transmissible mosaic.**—*Florists' Exchange*, lxxix, 14, p. 11, 2 figs., 1932.

In tests carried out during 1929–30 at the Oregon Agricultural

Experiment Station, the percentage of transmission of narcissus mosaic or 'gray disease' [*R.A.M.*, x, p. 162] by the introduction of diseased juice into scratched healthy leaves of the Talma and Sir Watkin varieties ranged from 35 to 63. Further tests were made in 1931 under specially controlled conditions on 'sister-bulb' plants, obtained as follows: (1) when the lots intended for inoculation were harvested, each bulb-clump was bagged separately; (2) at planting time the two largest bulbs from each clump were so planted that one could be inoculated and the other serve as an accurate control. These were planted in sets of ten in bed rows, and after the inoculation of the one set of sister-bulb plants, both these and the controls were left in place for percentage readings in 1932, when the amount of transmission shown by the inoculated plants was in some cases 20 per cent. against none in the controls.

In most parts of the United States the narcissus is practically free from aphids, and it therefore appeared probable that the disease might be spread through root contact, especially of injured roots, as well as by the (still unknown) insect carrier. Confirmation of this has now been obtained. Golden Spur bulbs of diseased and healthy stocks were planted in 1930 so that infected and sound plants were interspersed in the rows. In 1931 the mosaic plants were lifted, and in one of the test rows this roguing process exposed 62 adjoining plants to mosaic transmission by mutilating the roots. Of these 62 plants, 16 (25 per cent.) were found to have developed mosaic in 1932. Pending further experiments on a large scale, the writer recommends the removal not only of the diseased plants but also of the two adjoining.

CHESTER (K. S.). **A comparative study of three Phytophthora diseases of Lilac and of their pathogens.**—*Journ. Arnold Arboretum*, xiii, 2, pp. 232–268, 2 pl., 1 graph, 1932.

A detailed account is given of the author's comparative study of *Phytophthora syringae* [*R.A.M.*, ix, p. 626; x, p. 355], *P. cactorum* [ibid., ix, p. 390], and a strain herein designated Type A, all parasitic on lilac, the first-named from Europe and the others in the United States.

With regard to rate and type of growth on a number of standard media, *P. syringae* was found to differ markedly from the other two strains, which were in general rather similar. *P. syringae* was also distinguished from the other two forms by a more scanty production of oogonia, which were absent on various media, e.g., steamed bean pods and Lima bean agar, on which they were abundantly produced by *P. cactorum* and Type A. *P. cactorum* formed oogonia in unusually large numbers on many of the media used, while Type A was intermediate between the other two in this respect. Except by the sudden removal of the food supply (following Klebs's technique), sporangial production could scarcely be induced in any of the strains and appeared to be totally absent under normal conditions in *P. syringae*.

None of the organisms made appreciable growth at 29°, while at 27° only a few cultures of Type A and *P. cactorum* developed slightly. Extensive growth was made by the two last-named at 25°, which appears to be near their optimum, but *P. syringae*

failed to develop at this temperature, its maximum being 23° and its optimum about 20°. Corresponding differences were manifested in regard to hydrogen-ion concentration, the growth range for *P. syringae* being P_H 3·5 to 7·5, for *P. cactorum* P_H 3·0 to 10·0, and for Type A 3·0 to 9·5.

Morphological observations revealed some minor differences between the mycelial habit of the three species, the branching in *P. syringae* being monopodial, that of *P. cactorum* and Type A irregularly monopodial or sometimes approaching dichotomy; in the last-named the hyphae are much more profusely branched on maize meal agar than in the other species. The sporangia, which measured 20 to 40 by 15 to 30 μ in all three fungi, differed markedly as regards the type of papilla, which was very prominent in *P. cactorum*, in contrast to the flattened, inconspicuous papillae of the other two. This striking and constant character was found to be the most useful criterion for the differentiation of the otherwise similar *P. cactorum* and Type A. The mean and mode dimensions of the oospores of *P. syringae* were $31{\cdot}10 \pm 11$ and $32{\cdot}04\,\mu$ compared with $22{\cdot}94 \pm 0{\cdot}06$ and $21{\cdot}36\,\mu$ for *P. cactorum* and $24{\cdot}97 \pm 0{\cdot}09$ and $24{\cdot}92\,\mu$ for Type A. In all three organisms the antheridia are mainly paragynous and the oogonia broadly clavate to subspherical or spherical and usually terminal. The oospores have a thick triple wall, which in Type A is sometimes surrounded by a granular aura. Various types of abortive reproductive structures occur in all the three strains, but their development is so erratic that they cannot be used for specific differentiation.

Discussing the taxonomy of the lilac parasites on the basis of these physiological and morphological studies, the writer concludes that Type A resembles *P. cactorum* more closely than any other species of *Phytophthora*. However, on account of its different form of papilla and other less conspicuous variations, it is constituted a new variety, *P. cactorum* var. *applanata*.

P. syringae was found to be most active as a parasite on the woody tissues during the dormant period, while *P. cactorum* and its variety *applanata* were most prevalent on the succulent sprouts in the spring. These observations are consistent with the temperature relations of the fungi given above. Infection by all these organisms is favoured by a high degree of humidity, as well as by the method of cultivation known as 'heeling in', in which the buds are brought into close contact with the soil. Under ordinary American conditions there is probably little likelihood of destructive epidemics of the *Phytophthora* diseases, but control measures may well be necessary, as against *P. syringae* in Europe. These should be based on suitable cultural methods, supplemented by spraying with 4–5–50 Bordeaux mixture, which completely inhibited zoospore germination in laboratory tests.

POEVERLEIN (H.). **Die Gesamtverbreitung der Uropyxis sanguinea in Europa. (Nachtrag.)** [The distribution of *Uropyxis sanguinea* throughout Europe. (Supplement).]—*Ann. Mycol.*, xxx, 3–4, pp. 402–404, 1932.

Since the publication of the writer's previous survey of the distribution of *Uropyxis sanguinea* [*Puccinia mirabilissima*] on

barberry [*Berberis aquifolium*] in Europe [*R.A.M.*, x, pp. 316, 776], the rust has been found in a number of new localities [which are listed] in Germany, England, France, Switzerland, and Czecho-Slovakia.

Swift (Marjorie E.). **Phoma conidiogena on Box.**—*Mycologia*, xxiv, 2, pp. 199–206, 1 pl., 2 figs., 1932.

A brief morphological and cultural account is given of a strain of *Phoma conidiogena* [*R.A.M.*, xi, p. 374] which was isolated late in the summer of 1930 from dead leaf tips and blighted twigs of *Buxus sempervirens* var. *angustifolia* in the New York Botanical Garden, this being, so far as the author is aware, the first record of this fungus on this host. All the indications are that the organism is a weak parasite, apparently only capable of attacking the host tissues when they are weakened by other causes. Single spore cultures produced spores both of the *Phoma* and *Alternaria* types which, with the exception of one mutant, were also formed in all subsequent monospore subcultures from either type. The mutant appeared after nine months of frequent transferring in the form of an almost sterile sector with abundant white, flocculent aerial hyphae, contrasting sharply with the normal greenish-brown growth; subcultures from this sector developed very few pycnidia on corn meal agar as compared with the original strain; single spore cultures from these pycnidia gave a vegetative growth very similar to that of the original strain, but no spores of the *Alternaria* type were formed by the mutant cultures on any of the media tested.

Popp (M.). **Duwock und Giftpilz.** [Horsetail and poison fungus.]—*Oldenburg. Landw.-Bl.*, xxv, p. 400, 1931. [Abs. in *Biedermann's Zentrabl.*, Ab. A, lxi, 4, p. 281, 1932.]

Horsetail [*Equisetum*] in an enclosed plot in Oldenburg was found to be attacked and killed by *Fusarium roseum* [the conidial stage of *Gibberella saubinetii*].

Küster (E.). **Spritzmittel und Spritzmethoden im amerikanischen Obstbau.** [Spraying materials and spraying methods in American fruit growing.]—*Obst- und Gemüsebau*, lxxviii, 4, pp. 50–52, 1932.

An account is given of the writer's observations on the spraying methods and materials used in New York State against apple pests and diseases, with special reference to scab [*Venturia inaequalis*].

Kotte (W.). **Spritzmittelschäden im Obstbau.** [Spraying injuries in fruit growing.]—*Gartenbauwissensch.*, v, p. 525, 1931. [Abs. in *Fortschr. der Landw.*, vii, 11, p. 306, 1932.]

The writer's observations and experiments in Baden showed that arsenical sprays are the most liable to cause injury to vines, whereas in orchards copper-containing preparations are responsible for the bulk of the damage, arsenic and lime-sulphur being relatively innocuous [cf. *R.A.M.*, xi, p. 185]. The various types of injury on leaves and fruit are described. The extent of the damage depends

on a number of factors, such as the composition of the spray, the kind and variety of the fruit, climate and weather conditions, the physiological condition of the tree, and the health of the foliage. In connexion with these five points the relative merits of various commercial preparations are discussed. As a result of his investigations the writer recommends the employment of lime-sulphur in intensive fruit growing, the use of copper sprays being advisable only where this industry is of secondary importance.

JØRSTAD (I.). **Nyere resultater av forsøkssprøitning mot soppsykdommer på frukttraeer.** [Recent results of experimental spraying against fungous diseases of fruit trees.]—Reprinted from *Havedyrkningens Venners Medlemsskr.*, *1932*, 2, 7 pp., 1932.

The results [which are tabulated and discussed] of recent experiments in the control of some fungous diseases of fruit trees in Norway showed that pear scab [*Venturia pirina*] is amenable to control by three applications of 1 per cent. Bordeaux mixture [*R.A.M.*, viii, p. 584], immediately before and after flowering and when the fruit is beginning to form, the two former being the most important. Pear canker [*Nectria galligena*: ibid., vii, p. 677; x, p. 253] on the highly susceptible Keiserinne [Empress] variety was well controlled by a dormant application of carbolineum and 2 per cent. Bordeaux mixture at the unfolding of the leaves (or 3 per cent. copper sulphate just before this time).

Good control of apple scab [*V. inaequalis*] was obtained by one application of 1 per cent. Bordeaux mixture, followed by two of lime-sulphur and two of Burgundy mixture (0·5 per cent.) or by three of lime-sulphur and one of Burgundy mixture, or by three or four of lime-sulphur [ibid., xi, p. 49]. Where the preliminary application of Bordeaux mixture was omitted, Burgundy mixture was more effective than lime-sulphur for the later sprays, but the proportion of scab-free fruit was much lower than where the complete schedule was followed. In one series of tests two applications of Bordeaux mixture were more efficacious than three of lime-sulphur.

Two applications of a fungicide should be given against shot hole (*Clasterosporium carpophilum*) [ibid., xi, p. 803] and *Monilia* [*Sclerotinia cinerea*: ibid., iii, p. 282; v, p. 559] on cherries, viz., either 1 per cent. caustic soda with green soap before the emergence of the leaves and 0·5 per cent. Bordeaux mixture after flowering, or 1 per cent. Bordeaux mixture between the unfolding of the leaves and flowering and 0·5 per cent. of the same after flowering.

CUNNINGHAM (G. H.). **Orchard sprays in New Zealand. I. The sulphur series.**—*New Zealand Journ. of Agric.*, xliv, 3, pp. 177–186, 4 figs., 1932.

In this paper, the first of a series dealing with fungicidal and insecticidal preparations employed in the commercial control of parasitic diseases of orchard trees in New Zealand, the author discusses in some detail the chemical and physical properties of the available types of sulphur either in dust or colloidal form, the

methods for the assessment of their respective value, and their lethal action on the parasites.

KOHL (E. J.). **Investigations on Apple blotch.**—*Phytopath.*, xxii, 4, pp. 349–369, 2 figs., 7 graphs, 1932.

Full particulars are given of the writer's extensive investigations in Indiana on the factors governing the production of viable spores of the apple blotch fungus (*Phyllosticta solitaria*) [*R.A.M.*, iv, p. 742; x, p. 194] and on the methods of infection and subsequent development of the disease.

At La Fayette and Mitchell, pycnospores were mature in overwintered cankers in late April, while in young cankers, developing in May as a result of infection during the previous season, the spores were mature in July. Fertile pycnidia were formed on maize meal agar in about 21 days on thalli containing the original tissue planting, but not in subcultures. Fructification occurred in profusion between 19° and 21° C. Under natural conditions the interval elapsing between the morphological and physiological maturity of the spores was about six weeks. Spores germinated in water formed hyaline germ-tubes only, whereas on leaves olivaceous-brown germ-tubes and appressoria (10 by 6 μ) were produced.

Young Duchess apple trees were successfully inoculated in the leaf petioles by spores from natural sources and cultures. In the petiole the fungus does not penetrate beyond the collenchyma, along which it passes back through the abscission layer to the bark of the twig, where overwintering occurs in the cortical collenchyma. The time of natural infection in the localities under observation was shown, by experiments with potted trees from 1925 to 1928, to extend from late April or early May till about the middle of July. Very early infection occurred when protracted wet weather coincided with the time of physiological maturity of the inoculum (generally about the time of petal fall). The shortest interval between petal fall and infection was one day (La Fayette in 1927) and the longest 74 days (Mitchell in 1928). The incubation period was found to range from 18 to 24 days. Cankers seldom form in the season of infection. The development in the process of canker formation of abnormal parenchymatous tissue below the phellem took place not only from the cambium but also to a considerable extent in the secondary phloem. In 1927 at Vincennes, Indiana, petiolar infection was traced to cankers found on 1925 wood, and in 1928 a small amount of infection was found to have originated in cankers on 1927 wood, so that the infection cycle in the former season was two years and in the latter one year.

DUNEGAN (J. C.). **The bacterial spot disease of the Peach and other stone fruits.**—*U.S. Dept. of Agric. Tech. Bull.* 273, 53 pp., 7 pl. (1 col.), 2 figs., 1 map, 1932.

In the first stages of its attack on peach *Bacterium pruni* is intercellular, but later the cell walls are ruptured and bacteria are present in the remnants of the cells. Only the parenchymatous tissue is attacked in leaf and fruit spots, but in twig lesions the phloem is occasionally invaded. The result is the formation of a

cavity isolated from the healthy fruit and twig tissues by a layer of wound cork.

Experimental evidence was obtained that *Bact. pruni* decomposes peptone and beef extract, with the production of hydroxyl ions. When twelve carbohydrates were tested with a standard synthetic medium *Bact. pruni* fermented them without producing gas, an acid reaction being provoked in the medium. The organism grew vigorously on monosaccharides, but very poorly on disaccharides and trisaccharides.

Cultures on beef extract agar kept at 24° to 26° C. were still viable after 90 days, and on one occasion growth was obtained from a culture 146 days old.

Evidence was obtained that initial outbreaks of the disease were correlated with the presence of overwintered twig cankers, from a number of which the organism was isolated [*R.A.M.*, x, p. 225]; there was no indication that it overwinters on fallen leaves. From field observations, spread apparently takes place through the agency of wind, rain, and dew. An orchard survey showed that in one block of 102 trees the number of infected trees increased from 20 on 18th May to 49 on 30th June and 86 on 13th July; on each of the two later dates more than half the number of the infected trees were adjacent to trees previously infected. Fruit of susceptible peach varieties is liable to infection at any time after the calyces have fallen; young, succulent twigs are susceptible, but infection cannot occur when the tissues have matured.

Spraying with zinc sulphate and lime (4–4–50) [ibid., xi, p. 521], while not completely eliminating the disease, reduces the amount of defoliation and increases the percentage of saleable fruit.

A bibliography of 49 titles is appended.

WORMALD (H.). **Supplementary note on Plum bacterial canker.**—*Journ. Pomol. and Hort. Science,* x, 1, p. 64, 1932.

The author's attention was drawn to two papers by Bedford and Pickering in which a description was given of a canker in plum trees seen at Harpenden and Woburn during 1895 to 1898 and reported from various sources to be caused by *Nectria ditissima* [*R.A.M.*, vii, p. 676], *Micrococcus dendroporthes,* and *Eutypella prunastri* [ibid., iii, p. 405], respectively. From the description of the symptoms he considers that most probably the disease was identical with that recently described under the name of bacterial canker of the plum as caused by *Pseudomonas mors-prunorum* [ibid., xi, p. 379].

STEVENS (N.). **Market diseases of Strawberries from the south-eastern States, 1926 to 1930.**—*U.S. Dept. of Agric. Circ.* 219, 4 pp., 1932.

An analysis of the data furnished by the inspection of 9,543 carloads (or 13 per cent. of the total carload movement) of strawberries at terminal markets in the United States during the five-year period to 31st December, 1930, showed that over 40 per cent. of the cars inspected had non-rotted fruit, as compared with 32 per cent. during the seven-year period to 1925 [*R.A.M.*, vi, p. 240],

when 5·5 per cent. of the total carload movement was inspected. From 1926 to 1930, inclusive, the average amount of rotted fruit per car ranged from 2·5 to 9 per cent., while during the earlier period the corresponding figures were 3·8 to 15 per cent. During the former period the average amount of decay due to *Rhizopus nigricans* amounted to 1·54 per cent. and that due to [unspecified] brown rots to 2·34 per cent., the corresponding figures for the earlier period being 4·63 and 3·6 per cent. This marked improvement is considered to have resulted mainly from better methods of refrigeration and handling.

MAGEE (C. J.). **Leaf-fall of Bananas. Experiment indicates control by manuring.**—*Agric. Gaz. New South Wales*, xliii, 4, pp. 319–321, 1 plan, 1932.

The author states that since 1930 a diseased condition has appeared in banana plantations set out on old pasture and sugar-cane land in the Tweed valley of New South Wales, characterized by a premature withering and dying of the banana leaves in acropetal succession. The first symptom of the disease is the development in the laminae, midrib, and petioles of water soaked, somewhat oily areas which often attain considerable size, and may extend from the mid-rib to the margin; later these spots become brown and dry. Isolations from the lesions yielded a Gram-negative, gas-forming bacterium, the pathogenicity of which was, however, disproved in inoculation experiments, and the opinion was formed that the condition was possibly a physiological trouble due to exhaustion of the soil. This view was substantiated by experiments, in which the disease was controlled by applications to each banana plant of 4½ lb. of a mixture containing equal parts of superphosphate, muriate of potash, and sulphate of ammonia.

SMITH (F. E. V.). **Panama disease. The use of chemicals for killing Bananas in the treatment of Panama disease.**—*Trop. Agriculture*, ix, 3, pp. 83–86, 1932.

This is an expanded version of the author's account of the method devised by him for killing *in situ* the roots of banana trees affected with Panama disease (*Fusarium cubense*) [*F. oxysporum*: *R.A.M.*, x, p. 533]. In addition to the information already noticed, it is stated that light gas oils, delco oil, and kerosenes of various types were as effective as heavy gas oil in the killing of the banana roots, but they are not recommended for general use because of their higher cost. Experiments to test the effect of the oil treatment on subsequent plant growth showed that banana suckers, grapefruit seedlings, sweet potato cuttings, and cabbage plants planted from two to six months after the application of the oil all grew well, and the bananas fruited normally. It was also shown in tests with naturally infected banana material that the oil inhibits to a limited extent the growth of *F. cubense*, and very definitely reduces the amount of spore formation, while its destructive effect upon the infected banana tissues materially reduces the period of maximum activity of the fungus. Experience so far has shown that early treatment of the disease (as soon as the first symptoms appear in the leaves) tends

to reduce the rate of spread of the disease, probably because at that stage the fungus has not penetrated a great distance into the corm and pseudo-stem, and therefore all the infected area in the plant is rapidly killed by the oil.

LINFORD (M. B.). **Transmission of the Pineapple yellow-spot virus by Thrips tabaci.**—*Phytopath.*, xxii, 4, pp. 301–324, 7 figs., 1 diag., 1932.

This is the full report of the writer's experiments on the transmission of the pineapple yellow spot virus by *Thrips tabaci* in Hawaii, an abstract of which has already been noticed [*R.A.M.*, xi, p. 191]. The following points were not previously mentioned. The minimum incubation period in the weed host of the virus, *Emilia sagittata* [*E. flammea*], is about 8 days and the mean about 15, the corresponding periods for pineapple being 7 and 12, respectively. In addition to pineapple and *E. flammea*, *T. tabaci* transmits the virus to, and can recover it from, several other plants, e.g., *Senecio hieracifolia*, *Bidens pilosa*, and *Sonchus oleraceus*, on which further studies are planned.

MARTIN (H.). Научные основы дела защиты растений. [The scientific principles of plant protection.]—Russian translation with addenda by PETROFF (A. D.), TROITZKY (N. N.), FILIPIEFF (I. N.), & JACZEWSKI (A. A.), 359 pp., 2 figs., Гос. Научно-Техническое Издат. Ленхимсектор. [State Scientific-Technical Publishing Office, Lenchimsector], Leningrad, 1931. [Received June, 1932.]

This is a literal translation, with additions, into Russian of Martin's recent book on 'The Scientific Principles of Plant Protection' [*R.A.M.*, viii, p. 115]. The fairly extensive additional matter [in the form of interpolations in the text, marked by brackets] by the individual translators, each from his specialized knowledge of different branches of the subject, consist of observations and notes of interest from the Russian point of view. From among their number particular mention may be made of Jaczewski's statement that the annual loss of agricultural produce in recent years in Russia due to various plant diseases may be conservatively estimated at 30 per cent. of the total yield.

DOUNINE (M. S.) & SIMSKY (A. M.). **Die Haftfähigkeit der Fungicide.** [The adhesive capacity of fungicides.]—*Angew. Bot.*, xiv, 2, pp. 89–110, 1932.

In continuation of their previous studies [*R.A.M.*, xi, p. 441] a series of experiments [the results of which are fully discussed and tabulated] was carried out to determine the influence of various factors on the qualitative and quantitative character of the adhesion of calcium arsenate, potassium bichromate, copper carbonate, and other dusts to the seed of wheat, oats, hemp [*Cannabis sativa*], flax, broomcorn [*Panicum miliaceum*], and *Hibiscus cannabinus*.

The dusts adhered better to heavy seeds, e.g., those of wheat and *H. cannabinus*, than to light ones. No loss of adhesive capacity of the dusts followed the storage of treated wheat and oats for periods up to 3½ months. Some 6 per cent. of the adhering

dust was lost when the treated seed was passed through the Elworti sowing apparatus.

The dusts were found to be unevenly distributed over the seed, the bulk of the material collecting between the hairs ('seed corolla' of wheat) and glumes and in the depressions on the surface. Both mechanical adhesion and molecular forces are considered to govern the process of adhesion of the fungicidal particles to the seed.

RAPHAEL (T. D.). **Spray spreaders.**—*Tasmanian Journ. of Agric.*, N.S., iii, 1, pp. 1–4, 2 figs., 1932.

After noting in what ways the addition of spreaders increases the efficacy of different spraying mixtures, the author gives brief, popular notes on the composition and rate of application of the chief spreading agents in general use, including soap, flour paste, calcium caseinate, prepared white oils, glue, skimmed milk, and linseed oil, the particular sprays that are or are not suitable for use with each being indicated.

SCHNEIDERHAN (F. J.). **Instant Bordeaux.**—*West Virginia Agric. Exper. Stat. Circ.* 60, 8 pp., 4 figs., 1932.

Full directions are given for the preparation of 'instant' Bordeaux mixture [*R.A.M.*, viii, p. 391], in which copper sulphate crystals are replaced by powdered copper sulphate, known commercially as 'snow', and quicklime by superfine chemical hydrated lime, also termed high calcium hydrate. Pulverized copper sulphate is approximately equal in fineness to fine granulated sugar and may be dissolved in cold water in 1½ minutes, while superfine chemical hydrated lime is so fine that 99·5 per cent. will pass through a 325-mesh sieve, its approximate volume being 70 cu. in. per lb. The better grades of this lime contain 70 to 73 per cent. calcium oxide, of which 69 to 70 per cent. is available. The mixture may either be used in a spray tank or traction spray outfit. In addition to various other advantages, including rapidity of preparation and convenience of storage for indefinite periods, instant Bordeaux is actually cheaper than ordinary mixtures owing to the reduction in the amount of labour required and the elimination of special mixture tanks, though the price of chemical hydrated lime is a little higher than that of quicklime ($9 per ton compared with $8). Very satisfactory control of apple blotch (*Phyllosticta solitaria*) on Northwestern Greenings has been given by instant Bordeaux in three years' experiments.

WOODMAN (R. M.). **The evaluation of sulphur suspensions used in spraying.**—*Journ. Soc. Chem. Ind.*, li, 14, pp. 103T–107T, 1932.

An examination was made of the methods of analysis of fungicidal sulphur suspensions [*R.A.M.*, xi, p. 194], special attention being paid to determination of total solids, total sulphur, noncombined sulphur, and protective colloids. The suspensions used were an American (? 'atomic') suspension, two samples of ialine, and four samples of sulsol [loc. cit.].

The determination of total solids was made by various methods, of which the most direct and accurate (given new or non-sedimented

samples) was to place portions of each liquid, after thorough shaking, in tarred bottles and evaporate to dryness at 100° C. Using this method, the average total solids in ialine X amounted to 53·56 weight per cent. (gm. total solids per 100 gm. suspension), the corresponding figures for ialine Y and sulsol D being 53·68 and 57·30, respectively. The guaranteed amounts for the two preparations were 53·5 and 57·80, respectively. The specific gravity of sulsol D was found to be 1·37 (guaranteed 1·388). Three other methods are also described with the results obtained in each case.

The total sulphur was determined by H. G. Pike with the following results: American suspension: average total sulphur in dried residue 91·10 per cent., in suspension 64·31 per cent.; sulsol A: average in dried residue 65·92 per cent., in suspension 28·65 per cent.; sulsol B: average in dried residue 60·90 per cent., in suspension 28·23 per cent.; sulsol C: average in dried residue 74·61 per cent., in suspension 63·87 per cent.; sulsol D: average in dried residue, 74·70 per cent., in suspension 42·81 per cent.; ialine X: average in dried residue 93·91 per cent., in suspension 50·29 per cent.; ialine Y: average in dried residue 94·91 per cent., in suspension 50·94 per cent.

The amount of free sulphur in ialine X was found to be 51·72 per cent. (guaranteed 51·5), the average quantity in the dried residue being 96·59 per cent. In ialine Y the free sulphur amounted to 51·82 per cent. (guaranteed 51·5), the quantity in the dried residue being 96·54 per cent., while the corresponding figures for the American suspension were 64·65 and 91·56 per cent., respectively. The total solids of a 17·78 per cent. suspension of sulsol contained 58·65 per cent. of free sulphur, i.e., the original sample contained 27·19 per cent.; in a 12·11 per cent. suspension of sulsol C the total solids contained 68·1 per cent. free sulphur and the original 58·29 per cent.

The following amounts of non-combined sulphur were found in freshly diluted suspensions: American 0·948 per cent., sulsol D 0·427 per cent., and ialine Y 0·498 per cent. Thiosulphate sulphur was present only in the last-named to the extent of 0·001 per cent. Ialine and sulsol proved superior to the American suspension from the non-sedimentation standpoint, although it should be noted that in the latter case the sedimentation suspension had to be made from a two-months old suspension containing 4 per cent. of solids. It would appear from a comparison of these figures with those obtained in the 1930 samples that the increase of sulphur content in sulsol has been secured at the expense of a relative decrease in stability [ibid., x, p. 195], notwithstanding the greater absolute amount of sulphur retained in suspension and the augmented concentration of protective colloid, whereas in the case of ialine the 1931 sample is superior to that of the previous year in this respect.

Hopkins (S. J.) & Chibnall (A. C.). **Growth of Aspergillus versicolor on higher paraffins.**—*Biochem. Journ.*, xxvi, 1, pp. 133–142, 1932.

In connexion with studies on the metabolism of paraffins in the

plant, a strain of *Aspergillus versicolor* [*R.A.M.*, ix, p. 316] has been found to grow on synthetic higher paraffins as the sole source of carbon. The mould will grow on both odd- and even-number paraffins, but not on those with a longer chain than $C_{34}H_{70}$.

DORAN (W. L.). **Acetic acid and pyroligneous acid in comparison with formaldehyde as soil disinfectants.**—*Journ. Agric. Res.*, xliv, 7, pp. 571–578, 1 fig., 1932.

This is a brief account of experiments the results of which showed that 3 in 100 and 4 in 100 pyroligneous acid solutions, at the rate of 2 qt. per sq. foot, are more effective as soil disinfectants than either acetic acid [*R.A.M.*, vii, p. 526; xi, p. 496] or formaldehyde, and safer and cheaper than either. The treatment protected seedlings of beet, cucumber, and lettuce from damping-off and did not injure them even when it was applied to the soil as late as one day before sowing. It also resulted in an increase of the dry weight of the plants.

SCHWARTZ (G.). **Bodendämpfung als Kulturfaktor zur Bodenverbesserung im Gartenbau.** [Soil sterilization as a cultural factor in the improvement of horticultural soils.]—*Zeitschr. für Pflanzenkrankh. (Pflanzenpath.) u. Pflanzenschutz*, xlii, 5, pp. 193–232, 2 figs., 1 graph, 1932.

The theoretical, practical, technical, and economic aspects of soil sterilization by heat are discussed [*R.A.M.*, xi, p. 471], with directions for the application of the process (*a*) to flat surfaces, e.g., greenhouse soils, frames, seed-beds, and the like, and (*b*) to heaps of compost, etc. The various types of apparatus are described, with observations on the distribution of heat through the soil and the effects of sterilization. Some figures are given showing the costs of soil sterilization as compared with other methods of treatment, the calculations being made on the basis of financial conditions in Germany in September, 1931. A concluding note deals with the heating of the soil by electricity [see next abstract].

CARNEY (L. B.). **Electric soil sterilization.**—*Agric. Engin.*, xiii, 4, pp. 95–96, 1 fig., 1932.

In order to meet the requirements of market-gardeners with small businesses in the rural districts of New York, an electrically heated oven has been developed to sterilize greenhouse soil and destroy such common fungous parasites as *Septoria lycopersici* on tomato and *Rhizoctonia* and *Sclerotinia* spp. on lettuce [cf. *R.A.M.*, vii, p. 335]. A one-cubic-yard box of $\frac{1}{8}$ inch boiler plate, mounted 2 ft. from the floor on angle-iron legs, is furnished with heat by means of nichrome wire in a galvanized iron pipe running parallel through the box and spaced in such a way as to secure the best distribution of heat, insulation between the wire and pipe being effected by porcelain tubes. The brass bolts at each end of the tubes are insulated from the pipe on the outside by a fibre washer. The electrical connexions on the sides are wrapped with asbestos ribbon, and the sides and top are covered with a balsam wool blanket to reduce

radiation losses. Under normal operating conditions the sterilizer is run for $5\frac{1}{2}$ to 6 hours and uses 30 to 35 kilowatt hours.

BLANC (A.). **Les machines nouvelles au XI[e] Salon de la Machine Agricole.** [New machines at the XIth Exhibition of Agricultural Machinery.]—*Prog. Agric. et Vitic.*, xcvii, 12, pp. 287–292, 5 figs., 1932.

Among the agricultural machinery briefly described in this paper mention may be made of a motor-driven sprayer [cf. *R.A.M.*, xi, p. 247] exhibited by the Société des Anciens Établissements Brouhot of Vierzon (Cher). The new feature embodied in this apparatus is that the spraying liquid is drawn by vacuum suction, created by an independent pneumatic pump, into an air compression chamber, from which it is distributed under pressure to a number of spraying nozzles. By this means the spraying liquids, some of which are highly destructive to delicate mechanical parts, never come into contact with the pump. Constancy of pressure inside the air chamber is ensured by a specially devised by-pass [a diagrammatic section of which is given] to replace the usual safety valves, the regulation being automatic. The apparatus is stated to be particularly well adapted for spraying trees, because of the high pressures which may be attained in it.

HEIM (R.). **Rapport sur les maladies physiologiques et bactériologiques des plantes coloniales.** [Report on the physiological and bacterial diseases of colonial plants.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xii, 126, pp. 37–44, 1932.

After a very brief general review of the virus and bacterial diseases that attack cultivated plants, with particular reference to overseas crops, the author points out the lack, due to various causes, of serious phytopathological investigation in the French colonies, where many of these diseases are rife and cause considerable losses. To remedy this unsatisfactory state of things he advocates legislation for the creation of a special administrative organization for the study of the diseases of colonial crops.

NAOUMOFF (N. A.). Методы микроскопических исследований в фитопатологии. [Methods of microscopical investigations in phytopathology.]—224 pp., 4 pl., 51 figs., Гос. Издат. С.-хоз. и Колхозно.Кооп. Литературы. [State Publishing Office of Agric. and Collective Farming Co-operative Literature], Leningrad, 1932.

This is an elementary text-book for the beginner in the study of phytopathology, which the author states he was led from his teaching experience to compile in order to fill the lack of similar publications in Russian and the dearth of those in other languages. After a brief discussion of the principles of optics embodied in the microscope, he describes in detail the correct use of the instrument and all its various subsidiary apparatus. A special section is given to the preparation and staining of microscopical slides, including the preparation and application of the more usual differential stains.

PETRI (L.). **Sur une méthode pour effectuer les injections de virus dans les feuilles.** [On a method of making virus injections in leaves.]—*Deuxième Congr. Internat. de Path. Comp., Paris*, II. *Comptes rendus et Communications*, pp. 439–441, 2 diags., 1931. [Received July, 1932.]

Ordinary medical syringes having proved unsuitable for the inoculation of delicate plant organs, the writer has devised a special method for injecting mosaic virus into citrus leaves [*R.A.M.*, xi, p. 173]. Two metal disks are attached to the leaf by means of springs of the forceps type, the upper disk having fixed to it at an oblique angle a fine tube, within which a slender steel needle can be inserted. The leaf is punctured by pressure of the button at the top of the needle, which is then withdrawn and immediately replaced by a sterilized glass capillary tube filled with the expressed infective juice. The latter may safely be left in the leaf for 24 to 36 hours without disturbing its physiological functions, so that the virus is absorbed gradually.

HALL (A. D.). **Virus diseases of plants.**—*Gard. Chron.*, xci, 2364, pp. 293–294, 1932.

In connexion with a brief general survey of the information at present available on the virus diseases of plants, attention is drawn to the conspicuous increase of these diseases of recent years in English gardens, more especially upon monocotyledonous plants. Tulip 'breaking' [*R.A.M.*, xi, p. 183] is a well-known instance of long standing, while more recently freesia and gladiolus have become seriously affected, the symptoms being manifest as darker fleckings on the flowers. The same disturbance has been observed on the lily, iris, and crocus, and even on the sparsely cultivated *Sternbergia*. A virus disease characterized by yellow stripes and mottling on the leaves appears to be making heavy inroads among narcissi, in many varieties of which the bulbs rapidly weaken and die out. Observations made by Beaumont and Hodson at the Seale-Hayne Agricultural College tend to implicate thrips as the vector of this obscure disease, which is becoming a grave danger to narcissus growing and should be promptly combated by roguing.

STOREY (H. H.). **The bearing of insect-vectors on the differentiation and classification of plant viruses.**—*Deuxième Congr. Internat. de Path. Comp.*, Paris, II. *Comptes rendus et Communications*, pp. 471–479, 1931. [French summary on p. 470. Received July, 1932.]

Recent research has shown that the species of insect vector is usually characteristic of a virus. Most workers have abandoned the view that the insect is a mere mechanical carrier, and consider it as infected by the virus equally with the plant. In the present state of knowledge, a virus is better characterized by its insect vector than by its host or the symptoms produced on the latter. Thus, Stahl has shown that the maize leaf stripe of Cuba and Hawaii is transmitted by *Peregrinus maidis* [*R.A.M.*, viii, p. 160], which gave entirely negative results in the transmission of streak in South Africa [ibid., xi, p. 66] and Tanganyika, although the

symptoms of the two diseases are closely similar. Brandes's view (*Proc. Second Conf. Internat. Soc. Sugar Cane Technologists*, p. 104, 1927) that the African streak disease is 'obviously distinct' from the Cuban stripe will probably now find general acceptance on the basis of the difference of vectors.

At Amani the writer has observed two apparently distinct maize diseases, resembling streak [ibid., xi, p. 427] in general characters but not transmissible by *Cicadulina mbila*. He has also found that a second species, *C. zeae*, is able to transmit streak of maize in Tanganyika, and that the disease thus caused may be retransmitted by *C. mbila*. The specificity of the virus to its vector, therefore, is not absolute. There is also considerable evidence to show that strains of a virus may exist and there are also different races of insect vectors, some of which may vary in their ability to transmit a virus.

Euler (H. v.). **Recherches chimiques sur l'action de deux virus des végétaux.** [Chemical studies on the action of two plant viruses.]—*Deuxième Congr. Internat. de Path. Comp.*, Paris, II. *Comptes rendus et Communications*, pp. 459–461, 1931. [Received July, 1932.]

Comparative biochemical studies at Stockholm on tobacco plants suffering from mosaic and *Abutilon striatum* with infectious chlorosis [*R.A.M.*, xi, p. 387] showed a reduction in the chlorophyll, protochlorophyll, and lipochrome concentrations as compared with healthy plants. In dried chlorotic leaves of *A. striatum* the quantity of catalase in 5 mg. is expressed by the reaction constant 60, compared with 250 in normal foliage. The amylase content was found to remain unchanged both in mosaic tobacco and chlorotic *Abutilon* plants.

Experiments in collaboration with W. Hertzsch confirmed E. Baur's observation that infectious chlorosis of *A. striatum* is transmissible only by bud-grafting. All the leaves developing after infection become chlorotic while the older ones remain green. The results of inoculation with tobacco mosaic bear no proportion to the amount of inoculum used, total infection being secured by even very small quantities.

It would appear from these data that the viruses under discussion continue to develop after inoculation into the plant, a fact that precludes their classification as enzymes. They cannot, on the other hand, be termed microbes since they are devoid of cells, and they must therefore be given an intermediate place as 'enzymoids'. The genes and possibly the bacteriophages are also believed to belong to this group, which corresponds more or less to Eriksson's 'mycoplasm' [ibid., x, p. 260].

Phillips (J.). **Root nodules of Podocarpus.**—*Ecology*, xiii, 2, pp. 189–195, 1932.

This is an expanded account of the writer's investigations on the relative importance to the development of *Podocarpus latifolius* and *P. falcatus* in South Africa of *Pseudomonas* [*Bacillus*] *radicicola* and a mycorrhizal fungus, a preliminary note on which has already appeared [*R.A.M.*, xi, p. 258].

JARACH (M.). **Sul meccanismo dell' immunità acquisita attiva nelle piante.** [On the mechanism of active acquired immunity in plants.]—*Phytopath. Zeitschr.*, iv, 3, pp. 315–327, 5 figs., 1932. [German summary.]

In connexion with a discussion of the mechanism of acquired immunity in plants [*R.A.M.*, xi, p. 391], the writer recapitulates his experiments, at the Milan Serotherapeutical Institute, on the artificial immunization of beans [*Phaseolus vulgaris*] against *Botrytis cinerea* [ibid., viii, p. 457; x, p. 612].

JOHNSON (F. H.). **Effects of electromagnetic waves on fungi.**—*Phytopath.*, xxii, 4, pp. 277–300, 3 figs., 1932.

A study of the influence of gamma rays (from radium from which also some beta rays were transmitted), X-rays, Schumann, ultra-violet [*R.A.M.*, x, p. 772], visible light, and infra-red rays and Hertzian waves on over 1,500 cultures of *Collybia dryophila*, *Fusarium batatatis* [ibid., x, p. 506], and *Sclerotium bataticola* [*Macrophomina phaseoli*: ibid., xi, p. 27] showed that the inhibition of growth by radium (which was most complete in the first-named organism exposed through cellophane covers) was probably a beta-ray effect and thus not due to electro-magnetic waves. No variation was observed under the action of X-rays. Schumann rays were the most destructive but affected a smaller proportion of the mycelium than the ultra-violet rays proper. Ultra-violet rays passing through Corning filter 980 A, cutting off wave lengths below λ 2,302, were less effective than those through cellophane, which extended down to about λ 2,000 but exerted a stronger action than the rays traversing vitaglass, transmitting down to λ 2,536. The sole effect of various wave lengths of visible light was an increase of pigment in *F. batatatis* after exposures of a week or more to the full range. Infra-red rays above λ 7,000 and Hertzian waves of 50 and 100 m. did not affect the organisms used in the tests.

DICKSON (H.). **The effects of X-rays, ultraviolet light, and heat in producing saltants in Chaetomium cochliodes and other fungi.**—*Ann. of Botany*, xlvi, 182, pp. 389–405, 2 pl., 1 graph, 1932.

Malt-agar cultures of ten fungi, both in the mycelial and sporing stages, were exposed to the action of X-rays for periods ranging from five minutes to six hours at a distance of 5 to 18 cm., and of these *Mucor genevensis* [*R.A.M.*, iv, p. 758], *Phycomyces blakesleeanus* (*P. nitens*) [ibid., ii, p. 464], and *Chaetomium cochliodes* produced saltants, which did not occur in the non-irradiated controls and were evidently due, therefore, to the action of the rays. Saltants also developed in sporing cultures of the last-named fungus on exposure to ultra-violet rays from a mercury vapour-lamp for 50 minutes at a distance of 26 cm. Most of the saltants resulting from both methods of treatment remained true to type. Little effect was produced on the germinative capacity of the ascospores of *C. cochliodes* by exposure to the X-rays for periods up to six hours. However, a marked action on subsequent spore growth followed exposures up to four hours, the number of

spores developing only a small mycelium increasing in proportion to the time of irradiation. The subjection of the ascospores to temperatures of 45°, 55°, 67°, or 80° C. failed to induce saltation.

HOWARD (F. L.) & CURRIE (MARY E.). **Parasitism of Myxomycete plasmodia on the sporophores of Hymenomycetes.**—*Journ. Arnold Arboretum*, xiii, 2, pp. 270–284, 2 pl., 2 figs., 1932.

Laboratory experiments (conducted to supplement field observations in Canada and the United States) in which about 85 species of the Hymeniales, ranging from fleshy Agarics to woody Polypores, were inoculated with the plasmodia of 33 Myxomycetes gave positive results in a number of cases. The plasmodia of 15 species [which are enumerated] were found to be definitely mycophagous, while many others, as yet unidentified, showed various degrees of parasitism. The plasmodia destroy the sporophores by active digestion and also by leaving the slimy, injured tissues over which they have passed in an ideal condition for further bacterial and fungous infection.

SALAMAN (R. N.). **The analysis and synthesis of some diseases of the mosaic type. The problem of carriers and auto-infection in the Potato.**—*Proc. Roy. Soc. London*, Ser. B., cx, B766, pp. 186–224, 4 pl., 1932.

After briefly summarizing recent developments in the study of virus diseases of the potato, with particular reference to his own and K. M. Smith's work [*R.A.M.*, x, pp. 49, 615; xi, p. 394, *et passim*], the author describes in considerable detail experiments in which he has obtained evidence that, besides Smith's *x* and *y* viruses, there is a third element which he designates the *z* virus, the characters of which, differentiating it from the other two, are given in a table. Varieties suffering from crinkle 'A' [ibid., ix, p. 603], though clinically similar, were found to contain different virus complexes. They might contain both *x* and *y* or they might have *x* without *y*, but in each case with what the writer believes to be the uninoculable (though transmissible by grafting) virus *z*. By itself this *z* virus has a very limited pathogenicity, but in combination with either *x* or *y* it produces the diseases known as crinkle 'A' and para-crinkle [ibid., ix, p. 604], respectively; it was found to be also present in a streak-carrying Di Vernon unit, and probably occurs in many other infected plants. Evidence is adduced indicating that in para-crinkle as this disease occurs in the field (e.g., in King Edwards) the virus corresponding to the common *y* of other potato virus diseases differs somewhat from the latter, and in this paper it is designated virus *y′*, though its separate entity still remains to be proved. When the *y′z* complex of para-crinkle is passed through an intermediate *Datura stramonium* graft with leaves, only the *z* virus passes, causing a mild mosaic on Arran Victory and no symptoms on President.

By appropriate grouping of the three virus elements it has been possible to produce experimentally clinical symptoms of interveinal mosaic (*xy*), crinkle 'A' (*xz*), and para-crinkle (*yz*), in other words, to synthesize virus complexes in the potato. The synthesis

of the type of crinkle 'A' containing *xz* with *y* has not yet been established. The suggestion drawn from this work is that the reaction of a virus complex is not the mere summation of that of its constituents, but indicates that the complex is a linked group; it is further suggested that the stability of the linkage varies with the nature of the viruses concerned, and in particular with the internal environment of the host. There also was evidence that when a further virus element or a complex of such was added to a virus complex already existing in a plant, a condition was brought about in which the plant did not show any reaction, in the first season at least, and behaved as a carrier.

As shown on three occasions in para-crinkle in Arran Victory, a virus complex present in a plant may spontaneously break up at some actively growing point, in which case one or other of its constituents passes alone into a growing bud and there expresses itself by its usual clinical symptoms. Such a spontaneous splitting was definitely observed in one symptomless carrier variety and was suspected in two others, with the result that the apparently healthy plants became obviously diseased; this phenomenon is described as auto-infection.

Cytological studies of diseased plants showed that intracellular inclusions or X-bodies [ibid., xi, p. 532] are present in infections produced by the *x* virus or where this virus is present; they were absent, however, in infections due to the *y* virus alone and, with a doubtful exception, also in those caused by the *z* virus alone.

BURNETT (G.) & JONES (L. K.). **The effect of certain Potato and Tobacco viruses on Tomato plants.**—*Washington Agric. Exper. Stat. Bull.* (*Tech. Paper*) 259, 37 pp., 5 pl., 1 graph. 1931.

A full account is given of experiments conducted at the Washington Agricultural Experiment Station, Pullman, between 1929 and 1931, to ascertain the effect of certain potato and tobacco viruses when inoculated alone or in various combinations into tomato plants [cf. *R.A.M.*, xi, 394] and the intertransmissibility of these viruses.

The veinbanding virus (obtained from an Early Rose potato and apparently similar to one received from E. M. Johnson [ibid., x, p. 409]) plus the virulent latent virus (namely, the virus sometimes secured from apparently healthy potatoes, but capable of causing white rings and lines on tobacco and spot necrosis on tomato) produced spot necrosis of tomato and tobacco and symptoms very similar to rugose mosaic on potato.

The progeny from an Early Rose potato free from the latent virus when inoculated with rugose mosaic produced typical rugose symptoms. When tobacco mosaic was added to rugose mosaic and inoculated into potato plants affected with the veinbanding virus a more severe type of rugose mosaic was produced than when rugose mosaic alone was used as the inoculum. When potato plants already affected with rugose mosaic were inoculated with tobacco mosaic the rugose symptoms remained unaffected.

Early Rose potato plants carrying the veinbanding virus showed a mild type of rugose mosaic when inoculated with inoculum from

potato plants affected with crinkle mosaic, leaf roll, or spindle tuber (all carrying the latent virus).

The virulent latent virus produced a mild mottle with some necrosis on a virus-free Early Rose potato plant. This virus plus the veinbanding virus on virus-free Early Rose potatoes produced rugose mosaic symptoms including stem streak and leaf necrosis.

The virulent latent virus in combination with crinkle mosaic virus carrying a mild latent virus often produced much milder symptoms on potato, tomato, and tobacco than it did when used alone. The latent virus from crinkle mosaic appeared to produce an inhibitory effect on the expression of the virulent latent virus.

The latent or virulent latent virus was present in 48 tubers showing symptoms of crinkle mosaic, leaf roll, spindle tuber, super mild mosaic, mild mosaic, unmottled curly dwarf, rugose mosaic, and witches' broom.

Inoculum from apparently healthy potatoes carrying the latent virus produced symptoms on tomato and tobacco plants similar to those produced by inoculum from potato plants carrying leaf roll, spindle tuber, and crinkle mosaic; rugose mosaic inoculum gave additional symptoms of chlorosis and spot necrosis. When tobacco mosaic was added to inoculum from any of these sources tomato streak and tobacco leaf necrosis were produced.

When used alone or in combination with the virus of tobacco mosaic the latent virus remained active in dried tomato, tobacco, and potato seedling tissue for at least 46 days; it also remained sufficiently active in tomato plant tissue which had been dried 466 days to produce a 20 per cent. infection.

The latent virus appeared to be the only virus transmitted mechanically to tomato or tobacco from apparently healthy, leaf roll, spindle tuber, or crinkle mosaic potatoes; the veinbanding virus was transmitted from potatoes affected with rugose mosaic.

The veinbanding virus commonly remained active for 10 days in dried plant tissue and persisted for 46 days in dried tobacco leaf tissue.

The latent or virulent latent virus is capable of producing a lethal effect on tomato, tobacco, or potato, and this lethal effect is materially intensified when found in combination with tobacco mosaic.

Under field conditions, apparently, tobacco mosaic may be spread by insects and mechanical means; the latent virus is spread only by mechanical means.

BRYAN (H.). **The maintenance of healthy stocks of Potatoes in England.**—*Journ. Agric. Sci.*, xxii, 2, pp. 358–365, 1932.

In the experiments briefly described in this paper a batch of Majestic seed potatoes (an early maincrop variety) obtained from Scotland was divided into three lots, each of which was grown for three consecutive years at Ormskirk, Lancashire, in isolation from each other and from all other potatoes. In the first lot plants showing virus disease symptoms remained unrogued throughout the whole trial; in the second, all such plants were rogued out each season, and the seed tubers necessary for the next year were lifted

when mature; in the third lot, also rogued, the seed tubers were taken 9 or 10 weeks before maturity. The final produce was tested in 1931 for relative productivity and compared with a fresh batch of the same variety from Scotland, in a chequer-board yield trial, with the result that the Scotch seed gave a crop significantly larger than that of any of the three stocks produced locally. No significant difference was seen in the yields from the lines obtained by the second and third method, but both were significantly superior in yield to the unrogued stock. It is pointed out that the third method, i.e., lifting the seed tubers before maturity, apparently maintained the health, but not the cropping power of the stock, and it is believed that the almost complete absence of virus disease symptoms in this stock in 1929 indicates that the reduction in crop is attributable to some other cause, possibly the immaturity of the seed tubers.

From a practical point of view it is considered that the second method, i.e., saving the seed tubers when mature from rogued stud plots, is well worthy of trial by commercial growers who do not wish to renew their stocks from Scotland at too frequent intervals. The work also supplied a good illustration of the depressing effect of the virus diseases on yield.

EICHINGER. **Kartoffelschorf und Düngung.** [Potato scab and manuring.]—*Fortschr. der Landw.*, vii, 7, pp. 193–195, 1932.

The writer has continued his observations and investigations in Saxony on the effects of different fertilizers on the incidence of potato scab [*Actinomyces scabies*: *R.A.M.*, x, p. 402]. The disease was present on a plot that had received no synthetic fertilizers for ten years, so that infection could not be attributed to this source. A plot receiving ammonium sulphate only was practically free from scab both in 1930 and 1931, but the beneficial effect of this compound was found to be neutralized by an admixture of basic slag and potassium chloride. Where superphosphate was substituted for basic slag and potassium magnesium sulphate for potassium chloride, the incidence of scab was reduced. A marked increase of infection followed the replacement of ammonium sulphate by sodium nitrate.

KAHSNITZ & KLEINE. **Vorbeugende Massnahmen zur Bekämpfung des Kartoffelkrebses.** [Preventive measures in the campaign against Potato wart.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlvii, 14, pp. 248–249, 1932.

Of the 40,000,000 (on an average) doppelzentner of potatoes annually harvested in Pomerania, where the area under this crop covers 15·1 per cent. of the total cultivated land, 750,000 to 1,000,000 dz. is certified seed. Hitherto there has been no case of wart disease [*Synchytrium endobioticum*] in any of the seed potato farms, but isolated centres of infection have been found in allotments and the like, and in order to protect the valuable Pomeranian seed potato trade police orders have been issued prohibiting the cultivation, in farms and gardens up to 5 hect. in extent, of any varieties other than those officially recognized as wart-immune [*R.A.M.*, x, p. 684]. Exceptions to this rule may be made, at the

discretion of the competent authorities, up to 1st July, 1933. All seed potatoes used for planting in the above-mentioned small holdings must be officially passed for this purpose by the German Agricultural Society or the Chamber of Agriculture.

SALAMAN (R. N.). **Recent progress in the breeding of Potato varieties resistant to blight (Phytophthora infestans).**—*Deuxième Congr. Internat. de Path. Comp.*, Paris, II. *Comptes rendus et Communications*, pp. 436–437, 1931. [French translation on p. 435. Received July, 1932.]

A rapid and fairly reliable method, similar to that used by Müller in Germany [*R.A.M.*, x, p. 545], has been developed at Cambridge for tests on varietal resistance to late blight (*Phytophthora infestans*) in the potato. Seedlings are grown in closed glass cases under controlled conditions of temperature and humidity and sprayed almost daily with conidial suspensions of the fungus. The most susceptible are killed in five or six days, the more resistant survive for two or three weeks, and the immune individuals do not become infected. From hybrids between the virtually immune wild species, *Solanum utile*, and cultivated varieties a few highly resistant seedlings have been obtained, while during the last three years a few seedlings (only about 1 in 300 of certain families) of purely domestic parentage have also given promising results. The South American species, *S. antiporichi*, Aya papa, and Papa amarilla, and selfed seedlings of *S. utile* and *S. antiporichi* have proved immune, but the bulk of the F_1 progeny in the resistant × domestic crosses are susceptible, resistance to late blight evidently being a recessive genetic character.

BONDE (R.). **A promising blight resistant Potato.**—*Amer. Potato Journ.*, ix, 14, pp. 49–54, 1932.

Notes are given on the 'Foster's Rust Proof' potato variety which has proved extremely resistant to late blight (*Phytophthora infestans*) in Aroostook County, Maine, under conditions highly favourable to the development of infection. Surveys were made in 1930 and 1931 to determine the extent of the losses caused by late blight in the district under observation during seasons of serious epidemics [cf. *R.A.M.*, vi, p. 314]. On the experimental farm, badly blighted, unsprayed plots yielded about 100 bushels less per acre in both years (18 to 25 per cent. loss) than the treated plots. The value of a satisfactory resistant variety is therefore obvious. The Rust Proof potato (which is believed to have originated in New Brunswick, Canada, as a composite cross between Irish Cobbler, Green Mountain, Carman, and Beauty of Hebron) has smooth, white tubers and a tough, firm skin, which are desirable characters for breeding purposes.

MANNS (T. F.). **Chemical disinfection of Sweet Potato seed beds.**—*Trans. Peninsula Hort. Soc., 1931*, Delaware, xxi, 5, pp. 81–84, 1932.

Preliminary experiments with some twenty chemical treatments indicated that tuber diseases of sweet potatoes may be effectively controlled by watering the soil of old beds, when planting the

potatoes, with a 1 in 10,000 solution of mercuric chloride at the rate of 200 galls. per 500 sq. ft., a treatment which was shown to keep down the detrimental organisms for a period of two weeks. Other chemicals also gave promising results, and further work is in progress to establish the economic feasibility of the treatments.

PARK (M.) & BERTUS (L. S.). **Sclerotial diseases of Rice in Ceylon. 1. Rhizoctonia solani Kühn.**—*Ann. Roy. Bot. Gard., Peradeniya*, xi, 4, pp. 319–331, 1 pl., 1932.

In this, the first of a series of papers on the sclerotial diseases of rice in Ceylon, the authors give an account of their observations and experiments on a strain of *Corticium solani* found in association with a basal rot of the crop [*R.A.M.*, vii, p. 224]. The morphology and behaviour of the organism in culture were similar to those described in a previous paper [ibid., vii, p. 744], but a full discussion of these characters is reserved for the final issue of this series. Inoculation tests [considerable details of which are given] indicated that the fungus is capable of infecting and killing young rice seedlings under humid conditions, but its activity was in a large measure inhibited under conditions of medium and low humidity. Experiments with older plants, together with field observations, suggested that while the parasite is able to cause local infection of such plants under normal conditions, most of the mature plants recover. In no case was the fungus seen to penetrate the living roots either of seedlings or of mature rice plants.

Experiments to test the viability of the sclerotia of *C. solani* showed that these bodies retained their germinability after six years' storage in a corked tube in the laboratory, 130 days' exposure on air-dry rice soil or burial at a depth of ½ inch in such soil, and 224 days' immersion in tap water. The sclerotia began to lose their viability after exposure to direct sunlight for 183 hours during a period of 34 days, and were killed by 204 hours' exposure, the sun temperature during that period varying from 35° to 69·5° C., with a mean of 56·6°. The bearing of these data on the possible control of the fungus in the field is briefly discussed, with the inference that it can be checked only by direct treatment of infected soil, e.g., heating by incineration on it of the diseased crop and other vegetable refuse.

PARK (M.) & BERTUS (L. S.). **Sclerotial diseases of Rice in Ceylon. 2. Sclerotium oryzae Catt.**—*Ann. Roy. Bot. Gard., Peradeniya*, xi, 4, pp. 342–359, 2 pl., 1 graph, 1932.

Continuing their studies of sclerotial diseases of rice in Ceylon [see preceding abstract], the authors describe field observations and controlled experiments on *Sclerotium oryzae* [*R.A.M.*, vii, p. 224; xi, pp. 432, 469], the symptoms of which on young rice seedlings are a yellow and later brown discoloration of the leaves; lesions on the shoots, especially at water level; and the presence of sclerotia on and in the lower parts of diseased leaves, shoots, and in the roots. In plants approaching maturity in the field the disease is rendered conspicuous by the unusual production of tillers from the base of the stem or sometimes from nodes above

the soil; the affected stalks turn yellow and die and sclerotia occur in the base of the stem but not in the roots. The yield of infected stalks is usually nil, or a few light grains may be produced. Measurements of sclerotia formed in maize meal agar showed these bodies to range in size from 175 to 580 μ, the mean diameter being $374 \cdot 5 \pm 4 \cdot 3$ μ with a standard deviation of 92 μ. On comparison the Ceylon fungus was found to be identical in morphological and cultural characters with cultures obtained from the Centraalbureau voor Schimmelcultures, Baarn.

Laboratory inoculation experiments [details of which are given] indicated that under normal conditions for plant growth the parasitism of *S. oryzae* on rice is not very marked, while under abnormal conditions the seedlings became infected in every case. Root infection of the seedling occurred only after the aerial portions were infected, and then not always, and infection of the latter was more extensive in plants shaded from direct sunlight, indicating that atmospheric humidity is an important factor in the etiology of the disease. Mortality was higher when young plants were inoculated, but the resultant damage to the crop was greater when older plants were infected. Varieties of rice imported from Burma were much more severely attacked than a local variety grown under similar conditions. There was also some evidence of individual resistance to the disease.

Further tests showed that the sclerotia of *S. oryzae* remain viable on air-dried rice soil in the shade for $6\frac{1}{2}$ months, when buried in moist soil in the shade for $4\frac{1}{2}$ months, when submerged in water (in the presence of a green alga) for $10\frac{1}{2}$ months, and under dry conditions *in vitro* for $17\frac{1}{2}$ months; they were killed by one month's exposure to direct sunlight. These laboratory results are considered to indicate that none of the natural conditions prevailing in Ceylon can be utilized for the control of the disease, the only effective check to which is the incineration *in situ* of the infected rice plants [cf. ibid., x, p. 586], and measures directed towards the prevention of mechanical distribution of the sclerotia.

DOPHEIDE (A. B. A.). **Abnormale bladafval in volwassen Hevea-tuinen, als gevolg van aantasting door Phytophthora faberi.** [Abnormal leaf fall in mature *Hevea* gardens in consequence of infection by *Phytophthora faberi*.]—*De Bergcultures*, vi, 18, pp. 445–446, 2 figs., 1932.

During the abnormally rainy period from December, 1931, to March, 1932, the causal organism of stripe canker on *Hevea* rubber (*Phytophthora faberi*) [*P. palmivora*] was responsible for severe defoliation in the Proempang plantation, Java [*R.A.M.*, ix, p. 267]. The leaves fell from the full-grown trees with their petioles attached, the heaviest damage occurring in gardens shaded from the morning sun; in one such area 65 per cent. of the trees showed some defoliation, especially of the lower branches, 13 per cent. were practically denuded of all their leaves, while only 22 per cent. were unaffected. Spraying with Bordeaux mixture is impracticable in the region under observation, both on account of expense and by reason of topographical difficulties.

PARK (M.). **Fungus diseases and green manuring.**—*Trop. Agriculturist*, lxxviii, 2, pp. 67–82, 1932.

In this paper the author discusses [with numerous references to the relevant literature] the relation between the diseases [which are listed] of cover crops and green manures such as *Tephrosia candida*, *Vigna oligosperma*, *Centrosema pubescens*, *Crotalaria* spp., *Erythrina lithosperma*, *Leucaena glauca*, and the like, in Ceylon and those of the economic crops among which the former hosts are grown. Most of the diseases dealt with have already been noticed from other sources [*R.A.M.*, iii, p. 3; vi, pp. 582, 684; vii, pp. 68, 744; viii, pp. 202, 333, 524, 608].

s'JACOB (J. C.). **Rhizoctonia-aantasting bij Lamtoro.** [*Rhizoctonia* infection of Lamtoro.]—*De Bergcultures*, vi, 14, pp. 349–350, 1 fig., 1932.

In an experimental garden of the Besoeki Station, Java, lamtoro [*Leucaena glauca*] plants recently sustained extensive damage from the attacks of a species of *Rhizoctonia* which seemed to have spread from a plot of *Centrosema* [*pubescens*]. However, a comparative study of pure cultures of the lamtoro fungus with those obtained from *C. pubescens* showed that the former produced no sclerotia either on banana or oatmeal agar, while the latter formed brown sclerotia about 1 mm. in diameter. Cross-inoculation tests showed that the species from *C. pubescens* is unable to infect *L. glauca* and vice versa, so that the two forms are obviously physiologically distinct, though no differences were perceptible between the mycelia. Gandrup's species on *C. pubescens* [*R.A.M.*, iv, p. 565], which he named *R. solani*, was probably not identical with that observed on the same host by the writer, since the former is reported to have formed no sclerotia in pure culture. In view of the prevailing confusion regarding the taxonomy of *Rhizoctonia*, it is proposed to adopt K. S. Thomas's system of classification [ibid., ix, p. 443], grouping both forms under *R.* [*Corticium*] *solani* but adding the name of the host in each case, viz., *R. solani centrosemae* and *R. solani leucaenae*.

During a spell of exceptionally wet weather in February, the disease spread very rapidly over an area of some 10 bouw [7·1 hect.]. Among older plants the damage was confined to the leaves and young shoots, while the seedlings collapsed entirely. Good control has been obtained by six applications of Bordeaux mixture at three- to four-day intervals, but this practice would scarcely be practicable on a large scale on account of its high cost.

Shortly before this paper was sent to press, a report was received of the occurrence of a similar disease of *L. glauca* in Central Java, presumably due to *Rhizoctonia*.

JENSEN (H. L.). **Contributions to our knowledge of the Actinomycetales. II. The definition and subdivision of the genus Actinomyces, with a preliminary account of Australian soil Actinomycetes.**—*Proc. Linn. Soc. New South Wales*, lvi, 4, pp. 345-370, 2 pl., 1931.

In this paper the author gives a morphological and cultural account of some 23 species (four of which are new) of Actinomy-

cetes isolated from various Australian soils, with the purpose of obtaining a more reliable basis for the study of this group of organisms. The strains investigated fell into two main groups, the first of which (*Actinomyces, sensu strictu*) produced an aerial mycelium differentiating into spore-like bodies; and the second, for which the new generic name *Proactinomyces* is proposed, gave an aerial mycelium (sometimes nearly or wholly absent) without any differentiation into spores other than the breaking up of the hyphae into bacterium-like segments.

JONES (W.). **Downy mildew infection of Hop and Nettle seedlings in British Columbia.**—*Journ. Inst. of Brewing*, N.S., xxix, 4, pp. 194–196, 2 figs., 1932.

Seed of the common nettle of British Columbia, *Urtica lyalli*, was sown in moist chambers in the laboratory at Saanichton and inoculated, on the appearance of the cotyledons and primary leaves, with conidial suspensions of hop downy mildew (*Pseudoperonospora humuli*) [*R.A.M.*, xi, p. 402]. Within six days a few of the seedlings began to wilt, and subsequently oospores of the fungus were found in profusion in the tissues. A few conidiophores bearing conidia were also produced on some of the cotyledons and primary leaves. One of the infected seedlings was transferred to the greenhouse, allowed to grow to a height of about eight inches, replaced in the moist chamber, and again inoculated with conidial suspensions. In ten days or so several of the leaves were found to be slightly infected, showing angular brown areas near and between the veins. Oospores were found on all the diseased areas and conidia on a few of them. *U. lyalli*, therefore, is evidently not entirely immune from infection by *P. humuli*, as reported by Newton and Yarwood [ibid., ix, p. 677; cf. also ibid., x, p. 736]. Should the results of these laboratory tests be corroborated by field observations, the destruction of infected nettle and hop seedlings (which have also been found to contain the oospores of the fungus) in and near the hop gardens will constitute an important measure of control.

HARMAN (H. W.). **The spraying of Hops with Bordeaux mixture.**—*Journ. Inst. of Brewing*, N.S., xxix, 4, p. 197, 1932.

During 1931 the treatment of hops with Bordeaux mixture [against downy mildew, *Pseudoperonospora humuli*] was widely practised for the first time in England and an analysis of the amount of copper detected in the sprayed hops is therefore considered to be of interest. It was found that 60 per cent. contained from 1 to 50 parts per million of copper, 20 per cent. 50 to 100 parts p.m., and 20 per cent. 100 to 400 parts p.m. A hop containing 50 parts p.m. of copper would introduce $\frac{1}{300}$th grain per gallon of copper into the beer, an amount that cannot be regarded as harmful in the slightest degree. Analyses of foreign hops have demonstrated a copper content of up to 900 parts p.m., and possibly a similar quantity may occasionally be found in England, but subject to the precautions in spraying recommended by Prof. Salmon [*R.A.M.*, xi, p. 471], there is clearly no risk that the purity of the beer will suffer or brewing operations be disor-

ganized. Care must be taken, however, that no excess of copper is allowed to reach the yeast.

DODDS (H. H.) & FOWLIE (P.). **Experiments to test the effects of streak disease on Uba Cane.**—*South African Sugar Journ.*, xvi, 4, pp. 231, 233, 1 fig., 1932.

On 26th October, 1927, four plots were planted with streak-diseased Uba cane [*R.A.M.*, xi, p. 540] and four with healthy, three seed pieces, each having one eye, being placed in each hole. Out of 1,728 healthy eyes planted, 1,535 (88·82 per cent.) germinated, the corresponding figure for the diseased being 1,411 (81·65 per cent.). The plants were then thinned out so that only one was left in each hole. In the following July, when the crop was cut, the average yield of the streak plots was found to be 39·75 tons per acre, compared with 44·78 for the healthy, corresponding to an average decrease in the former of 11·24 per cent. On 19th November and 31st December, 1929, counts were made of the number of plants that had contracted secondary infection; the percentages in the four plots on the latter date were 40·97, 68·05, 52·08, and 52·00, respectively. In June, 1931, when the first ratoon crop was cut, the average yield of the streak plots was 32·72 tons per acre, compared with 36·49 for the healthy, corresponding to an average decrease in the former of 10·33 per cent. The average weight of the diseased sticks was 0·95 lb. a stick, as against 1·06 lb. in the healthy ones. On 21st November, 1931, the percentages of infection in the four streak plots were 63·9, 79·9, 70·8, and 67·5, respectively.

FARIS (J. A.). **The utilization of varieties in the field control of Sugar Cane mosaic and root diseases in Cuba. (A preliminary report.)**—*Trop. Plant Res. Foundation, Scient. Contrib.* 20, 69 pp., 1931. [Received July, 1932.]

According to Bruner's first report (*Cuba Estac. Exper. Agron. Circ.* 61, 1925), the reduction in the weight of Cristalina sugarcane due to the use of mosaic seed cane in Cuba [*R.A.M.*, x, pp. 271, 689] amounted to 62·9 per cent., while in a further account of the same series of tests (*Mem. Gen. Dept. Agric., Comb. y Trab.*, p. 44, 1931) the losses in the successive ratoon crops on the polvillo (fine dust) red type of Matanzas clay are given as 84·11, 81·95, 74·39, and 95·5 per cent., respectively, making an average of 79·5 per cent. for the five crop period. In two series of tests by the writer on Rio Cauto clay soil, the average annual losses from mosaic over a five-year and a three-year period, respectively, were 11 and 8 tons of cane per acre (30·82 and 23·42 per cent. of the yield).

Some general considerations are reviewed, arising out of the data [which are fully tabulated] from varietal reaction tests occupying the greater part of this paper. The replacement seems imminent of the highly susceptible Cristalina by S.C. 12/4 or one of the P.O.J. varieties, of which 2725, 2727, and 2878 are resistant to mosaic [ibid., xi, p. 541] and therefore more suitable for cultivation on certain types of soil where S.C. 12/4 is liable to succumb. The B.H. 10(12) variety is very susceptible to mosaic and its value is therefore limited to areas in which the spread of this disease is

likely to be slow. The sucrose content of P.O.J. 2727 and 2878 is low, particularly in the former, so that these varieties will probably not be permanently adopted in districts where satisfactory results are given by canes with a higher sucrose content. The Co. 281 variety has been found somewhat susceptible to mosaic [ibid., ix, p. 87] and was consequently discarded from further testing.

ORIAN (G.). **Maladies et apparences anormales observées sur la P.O.J. 2878 à Maurice.** [Diseases and abnormal growths observed on P.O.J. 2878 in Mauritius.]—*Rev. Agric. de l'Ile Maurice, 1931*, 60, pp. 230–232, 1931. [Received July, 1932.]

Quoting from a communication received from Java, the author states that the stem galls recently described by him on P.O.J. 2878 sugar-canes and a few other varieties in Mauritius [*R.A.M.*, xi, p. 265] are of fairly frequent occurrence in Java on that and some other recent varieties of P.O.J. canes. Opinion in that country (though so far lacking experimental proof) is that these galls are the result of mechanical injuries to the setts and are not of an infectious nature or of any economic importance. When setts bearing galls are planted, one or two of the more vigorous shoots produce normal canes, while the remainder die off.

In Mauritius the P.O.J. 2878 cuttings occasionally produce a cluster of weak, spindling shoots, due to the early development of the normal buds; in other cases, however, there is an abnormal growth of very numerous shoots arising from adventitious buds that form on callosities on the sett rhizome, the witches' broom appearance being much more marked in the latter than in the former case. In a few cases some of the abnormal shoots died prematurely, and others turned completely white.

Cases of leaf scald (*Bacterium albilineans*) [ibid., ix, p. 491] were observed on P.O.J. 2878 in three localities of Mauritius in 1931, and the number of plants affected is believed to indicate a rather high susceptibility of this cane to scald, taking into consideration the short time that this variety has been in the island.

PETRAK (F.) & CIFERRI (R.). **Fungi dominicani. II.** [Dominican fungi. II.]—*Ann. Mycol.*, xxx, 3–4, pp. 149–353, 1932.

The present important contribution to the knowledge of tropical micro-fungi is stated to be based chiefly on the study of a large collection from the Dominican Republic submitted to the authors by the late Dr. E. L. Ekman [cf. *R.A.M.*, x, p. 756]. A very large number of new species and a good many new genera are included, all of which are furnished with diagnoses in Latin and German. Few of the hosts are of economic importance. The list is enriched with copious morphological and taxonomic notes, not only on the new but also on many of the previously known species.

UNAMUNO (L. M.). **Notas micológicas. II. Adiciones a los Hifales de la flora española.** [Mycological notes. II. Additions to the Hyphales of the Spanish Flora.]—*Bol. Soc. Española Hist. Nat.*, xxxii, 3, pp. 161–169, 2 figs., 1932.

Continuing his critical studies of fungi collected in various parts

of Spain [*R.A.M.*, xi, p. 328], the writer here enumerates 30 species and two varieties of Hyphales belonging to the Tuberculariaceae, Dematiaceae, and Mucedineae.

Cercospora capsici Unam. n. sp. [but see *C. capsici* Heald & Wolf, 1911; *C. capsici* Marchal & Steyaert, 1919: ibid., xi, p. 281] occurring in association with *Oidiopsis sicula* Scal. [loc. cit.] on living leaves of *Capsicum annuum* in Valencia, formed numerous amphigenous, scattered or confluent, circular to ellipsoid, brownish to black, diffuse spots, 5 to 10 mm. in diameter. The fungus is characterized by dark brown stromata, 34 to 39 by 28·5 to 45 μ, from which arise fasciculate, straight or slightly curved, continuous, simple, yellowish-brown conidiophores, 31·2 to 37·5 by 4·5 to 5·5 μ, producing polymorphous, cylindrical, fusoid, uni- to tri-septate, acrogenous, yellowish-brown conidia, 34·2 to 77·1 by 3·5 to 5·5 μ at the broad basal part, tapering towards the apex or more rarely undulating. *O. sicula* is a new record for Spain and is stated not to have been previously reported on *C. annuum*.

SĂVULESCU (T.) & RAYSS (T.). **Nouvelle contribution à la connaissance des Péronosporacées de Roumanie.** [New contribution to the knowledge of the Peronosporaceae of Rumania.] —*Ann. Mycol.*, xxx, 3–4, pp. 354–385, 14 figs., 13 graphs, 1932.

Taxonomic and geographical notes are given on 42 species of Peronosporaceae collected by the authors in Rumania since the publication of their previous study on the same subject [*R.A.M.*, x, p. 130]. The list comprises several new species which are furnished with Latin diagnoses and frequency curves of their conidial dimensions, but in general the hosts are of little economic importance.

SPARROW (F. K.). **Observations on the parasitic ability of certain species of Pythium.**—*Phytopath.*, xxii, 4, pp. 385–390, 1932.

Details are given of the methods and results of the writer's experiments on the pathogenicity of *Pythium dictyosporum*, *P. angustatum*, and *P. adhaerens*, the last-named isolated from the green alga *Rhizoclonium hieroglyphicum* and the others from *Spirogyra crassa* [*R.A.M.*, x, p. 625] to various algae and phanerogamic plants. *P. adhaerens* was found to be the most virulent parasite on the algae.

Both *P. adhaerens* and *P. dictyosporum* infected all the Granite State, White Wonder, and White Spine cucumbers into which they were inoculated, the rot produced being of the 'leak' type [cf. ibid., vii, p. 2]. *P. adhaerens* also infected green and ripe tomato and Yellow Summer Crookneck squash fruit, and produced a root rot of Mammoth White Cory maize and Breck's Old Glory pea seedlings. Seedlings of the maize variety in question were also attacked by *P. angustatum*. *P. adhaerens* was the only one of the three species found capable of infecting sugar beet seedlings (Klein's Wanzleben), 85 per cent. of which developed symptoms of damping-off.

NANNFELDT (J. A.). **Studien über die Morphologie und Systematik der nicht-lichenisierten inoperculaten Discomyceten.** [Studies on the morphology and systematics of the non-lichenized, inoperculate Discomycetes.]—*Nova Acta Reg. Soc. Scient. Upsaliensis*, Ser. iv, viii, 2, 368 pp., 20 pl., 45 figs., 2 diags., 1932.

This monograph covers a much wider range than its title suggests, for the first 56 pages comprise a masterly discussion of the systematics of the Ascomycetes. *Spermophthora gossypii* [*R.A.M.*, viii, p. 201; x, p. 120], the most primitive of all the known Ascomycetes, is characterized by an antithetic alternation between a haploid and a diploid generation. The former terminates with the formation of gametangia, the gametes of which fuse and give rise to a diploid generation culminating in the production of typical asci.

The higher Ascomycetes are divided into three main groups in an ascending scale, viz., Plectascales, Ascoloculares, and Ascohymeniales, the first comprising the Gymnoascaceae, Aspergillaceae, Cephalothecaceae, Ophiostomataceae, and Chaetomiaceae; the second, the Perisporiales, Myriangiales, Hemisphaeriales, and Pseudosphaeriales (Dothioraceae, Pleosporaceae, and Mycosphaerellaceae); and the third, the majority of the Discomycetes and the true Pyrenomycetes, namely, Pezizales, Ostropales, Helotiales, Lecanorales, Sphaeriales, Diaporthales, Valsales, Coronophorales, and Clavicipitales.

DAVIDSON (R. W.). **Notes on tropical rusts with descriptions of two species.**—*Mycologia*, xxiv, 2, pp. 221–228, 2 figs., 1932.

In this paper the author gives notes on 14 species of rusts from Central America, two of which are considered to be new to science, and Latin diagnoses of which are appended. Among them mention may be made of *Spirechina pittieriana* (P. Henn.) Arth. (characterized by large spiny uredospores) on *Rubus* sp. and *Puccinia paulensis* on *Capsicum annuum* in Guatemala, both being new records from that country. The aecidia and teleutosori of *P. paulensis* cover large areas of the stems, leaves, and flowers of the host, and distort the affected parts; in Guatemala no pycnidia or uredosori of the rust were found, and the teleutospores were often formed in the old aecidia. It is pointed out that Kern and Whetzel have recently described the aecidial stage of what they believed to be a new rust on *Capsicum* in Colombia (*Journ. Dept. Agric. of Porto Rico*, xiv, pp. 301–348, 1930), their description fitting very well with the same stage of the Guatemalan fungus. This and other data in the literature [a brief review of which is given] would make it probable that *P. paulensis* is more widely distributed than previous records indicate.

GHIMPU (V.). **Bolile cu virus ale Tutunului.** [Virus diseases of Tobacco.]—Reprinted from *Bul. Cultivărei şi Fermentărei Tutunului*, Bucareşt, xxi, 2, 54 pp., 11 pl., 1932. [French summary.]

From his field observations and controlled experiments in Bucarest the author gives a detailed description of four virus

diseases of tobacco which he found occurring in Rumania, namely, mottled mosaic, ring spot, veinbanding, and spot necrosis. He distinguishes four forms of ring spot, in which no transitional characters from one to the other could be seen. As far as he is aware, this disease had not been previously recorded from Rumania. The remainder of the paper is occupied by a discussion of the relevant literature [a bibliography of which is appended, covering some 120 titles], and an account of the author's inoculation experiments and cytological study of diseased tobacco plants.

PITTMAN (H. A.). **Downy mildew (so-called 'blue mould') of Tobacco. Found occurring naturally on wild Tobacco (Nicotiana suaveolens) in the Wheat belt. Precautions necessary during the forthcoming season.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., ix, 1, pp. 97–103, 3 figs., 1932.

Continuing his studies of the tobacco downy mildew (*Peronospora* sp.) problem in Western Australia [*R.A.M.*, xi, pp. 8, 408], in this paper the author reports the discovery in 1931 of the widespread occurrence of the disease on wild tobacco (*Nicotiana suaveolens*) in several localities of the Western Australia wheat belt far removed from fields of cultivated tobacco. This discovery tends to confirm the already existing suspicion that the fungus is indigenous in Australia, and to explain the severity of its outbreaks from the very inception of the tobacco-growing industry there. It also indicates the inadvisability of the practice of some tobacco growers of having their seedlings grown in the wheat belt. The paper terminates with a discussion of control measures, among which the necessity is stressed of a strict removal of all tobacco plants after harvest, whether cultivated or volunteer, to prevent the overwintering of the fungus in the fields.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, 2, pp. 48, 61–66, 1932.

GERMANY. As from 2nd February, 1932, the importation into Germany of rooted plants of the genus *Ulmus* and the Canadian poplar (*Populus canadensis*), as well as of cuttings, slips, graft shoots, and other fresh shoots of these plants is prohibited until further notice [presumably with a view to the exclusion of *Graphium ulmi* on elms, and canker and *Dothichiza populea* on poplars: *R.A.M.*, x, p. 567; xi, pp. 274, 338]. Permission for the import of woody plants other than those named will be granted only on the production of a duly authenticated certificate vouching for the freedom of the consignment from any admixture of elm or poplar plants or parts thereof.

GREECE. An Order of 22nd August, 1929, prohibits the importation into Greece from foreign countries (whether infested by *Phylloxera* or not) of vine stocks of every kind and of all parts thereof either in the fresh or dry state (other than mash, must, and wine); of organic or plant manures or mixtures thereof; of soil, humus, and any kind of ship's ballast consisting of soil, gravel mixed with soil, or sand; and of all manner of plants in the fresh

state and of fresh cuttings, shoots, roots, tubers, stalks, bulbs, rind, branches, leaves, flowers, and fruits of garden plants, e.g., tomatoes, cucurbits, eggplants, and vegetables in general. Cuttings without roots and seeds may be imported subject to a permit from the Ministry of Agriculture, and fresh orchard fruits are admitted without restriction.

Advies aan importeurs van planten, stekken, bollen, knollen, vruchten en zaden. [Notice to importers of plants, cuttings, bulbs, tubers, fruits, and seeds.]—*De Bergcultures*, vi, 15, pp. 386–389, 1932.

The following are among the regulations governing the importation of plant material into the Dutch East Indies, issued 15th November, 1929, revised 15th May, 1931. All consignments of living plant material (including fruits and seeds) with certain exceptions [which are listed] from foreign countries (including Holland) must be accompanied by a duly authenticated certificate guaranteeing the freedom of the goods from diseases and pests. Potato consignments from certain [named] countries must further be accompanied by a certificate stating that the material is free from wart disease (*Synchytrium endobioticum*), and that the causal organism is not known to occur within a radius of at least 500 m. from the place of cultivation. The importation of *Hevea* rubber plants or parts thereof (including seeds) from South America is strictly and entirely prohibited, and is permitted from other countries only on production of a certificate guaranteeing the freedom of the material from South American leaf disease (*Passalora heveae* or *Fusicladium macrosporum*) [*Dothidella ulei*: *R.A.M.*, v, p. 689] and *Phytophthora* leaf fall [ibid., ix, p. 405], and vouching for the fact that the plantations in which the plants originated were not supplied with material from countries infested by these diseases.

Gesetze und Verordnungen. [Laws and regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 4, pp. 30–32, 1932.

Guatemala. As from 24th September, 1931, consignments of living plants entering Guatemala must be accompanied by properly authenticated certificates stating, in addition to other particulars, that the nurseries and seed selection establishments in which the plants originate are absolutely free from plant diseases of any kind.

Turkey. By an Order of the Turkish Government dated 9th December, 1931, the following agricultural produce may be imported into Turkey during the first quarter of 1932 without restriction other than an official permit: sugar beet, potato, wheat, and other seed, tree and vine cuttings, vegetable and flower seed of all kinds, young plants and bulbs. On 20 February, 1932, this list was supplemented, on the basis of an Order regulating imports for the second quarter, by freshly rooted flower cuttings and grafts.

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MOORE (E[NID] S.). **A virus disease of Tobacco in South Africa.**—*Nature*, cxxix, 3258, p. 544, 1932.

A virus disease of tobacco somewhat similar to, but distinct from, ring spot [*R.A.M.*, xi, p. 406] is stated to be causing increasingly heavy losses each year in the Stockenstrom district of the eastern Cape Province. A constant feature of the disturbance is the sudden cessation of apical growth and the stunting of the leaves that are in process of formation. Leaf spotting is usually of a ring spot or hieroglyphic type, often definitely related to the veins in a fern-leaf pattern. The young leaves show marked distortion and blistering, often accompanied by vivid mottling. In varieties of the Burley type general chlorosis is common, followed by discoloration of the cortex and pith of the stem and by root decay associated with secondary organisms. Diseased plants either die outright or survive in a stunted condition, sometimes making partial recovery and putting out new growth from terminal or lateral shoots.

The disease is very rarely transmissible by needle puncture but may readily be induced by the insertion of an affected shoot, as in grafting. The best mode of transmission, however, is by the feeding of a thrips of the *Frankliniella* type which under field conditions appears to be the sole vector.

In the same locality tomatoes are affected by a disease apparently identical with the spotted wilt of Australia [ibid., xi, p. 549]. Distinctive diseases of *Datura stramonium*, two species of *Physalis* and *Nicandra physaloides* also occur in the fields and are transmitted by the same insect vector. Cross-inoculation experiments indicate that all six diseases are caused by an identical virus.

BRIANT (A. K.). **Tomato diseases in Trinidad.**—*Trop. Agriculture*, ix, 3, pp. 63–71, 3 pl. (1 facing p. 88); 4, pp. 101–105, 1932.

In this paper the author gives some details of the investigation started in 1931 of the etiology and control of the chief physiological and parasitic diseases that attack tomatoes in Trinidad. Among the economically important troubles of the crop are stated to be the wilt diseases caused by *Bacterium solanacearum* [*R.A.M.*, x, p. 493], *Fusarium lycopersici* [ibid., x, p. 742],

and *Sclerotium rolfsii* [ibid., x, p. 752], all of which occur commonly in the island and occasionally cause almost total loss of the crop. The occurrence of the two first-named organisms in the soil and their pathogenicity to tomato plants were amply demonstrated by isolations and inoculation experiments [considerable details of which are given]. In discussing control measures against these diseases, including crop rotation, field sanitation, and the avoidance of seed from diseased plants, it is stated that so far there is no evidence of varietal resistance to *Bact. solanacearum* in the tomato, and no varieties resistant to *F. lycopersici* have yet been determined in Trinidad [cf. ibid., xi, p. 356]. The other fungal diseases dealt with include leaf mould (*Cladosporium fulvum*) [ibid., x, p. 764; xi, p. 409], which in Trinidad occurs in the field and is most severe in sheltered positions; leaf spot (*Septoria lycopersici*) [ibid., x, p. 707], which is fairly common, but is rarely severe enough to cause much defoliation; *Phoma destructiva* [ibid., x, p. 414], which has been isolated from spots on leaves, stems, and fruits, and is prevalent in both the wet and the dry seasons, attacking mature plants, as well as causing considerable damage to seedlings in the nursery, in which it can kill most of the leaves and produce serious lesions on the stems; and mosaic, which at certain seasons of the year almost completely destroys the crop in small plots and gardens. The symptoms of mosaic in Trinidad are stated to vary considerably, one type consisting of a simple mottling of the leaves with little reduction in yield and another causing stunting, with considerable distortion and malformation of the leaves, and sterility. Symptoms resembling aucuba mosaic have also been noticed.

The fruit rots briefly described comprise those caused by a species of *Phytophthora* on tomatoes growing near or touching the ground; and by a bacillus closely resembling *Bacillus aroideae* [ibid., xi, p. 344], which appears to be a wound parasite, as experiments indicated that tomato fruits in the field are chiefly infected with it through the agency of various sucking insects (e.g. *Leptoglossus balteatus* and *Pthia picta*). During the dry season of 1931 over 50 per cent. of the diseased fruits tested yielded different strains or species of *Phomopsis*; in several instances the fungus was isolated from fruits immediately after picking, indicating that infection may occur in the field. Isolations from decaying tomatoes occasionally yielded *Phoma destructiva* and also a species of *Gloeosporium*, the parasitism of which was demonstrated. Species of *Fusarium* are commonly found on tomatoes showing signs of mechanical or physiological injury, but all the indications are that they are only secondary organisms.

WESTENBERG (J.). **Uit de historie van de Graphium-ziekte in de Iepen.** [Concerning the history of the *Graphium* disease of Elm.]—*Tijdschr. over Plantenziekten*, xxxviii, 4, pp. 61–66, 1932. [English summary.]

The designation of Dutch elm disease for the malady caused by *Ceratostomella (Graphium) ulmi* [*R.A.M.*, xi, p. 409] is regarded as misleading, since it is evident from Guyot's description of the symptoms that he observed in 1918 in northern France [ibid., xi,

p. 551] that the elm disease described by him was due to this organism, though attributed at that time to physiological factors. In 1930 the writer saw the elm disease in the Auvergne district of France, and *C. ulmi* was isolated by Prof. Westerdijk from infected twigs collected in that region. Since the country in which the trouble originated is unknown, the writer advocates the use of the now familiar term '*Graphium* disease of elms' in place of the incorrect and unjustifiable 'Dutch elm disease'.

D'OLIVEIRA (B.). **Apontamentos para o estudio de duas doenças do Sobreiro.** [Preliminaries for the study of two diseases of the Cork Oak.]—Reprinted from *Rev. Agron.*, Lisbon, xix, 2, 19 pp., 9 figs., 1931. [English summary. Received July, 1932.]

The inner bark of the cork oak (*Quercus suber*) along the banks of the Tagus is stated to be attacked by two fungi, namely, *Endothiella* (?) *gyrosa* Sacc., the agent of orange 'rust', and *Nummularia regia* (de Not.) Sacc. (*Hypoxylon regium* de Not.), causing 'coal disease'.

E. (?) *gyrosa* covers the affected area with an orange mycelium and closely adherent sclerotioid masses, often also involving the interstices of the cortex. The fungus is characterized by subglobose, ellipsoid, oval, or irregular pycnidia, up to 900 μ in diameter, with a pale yellow excipulum and an almost flat, subhysteroid ostiole; simple or sparsely branched, mostly curved, continuous, hyaline sporophores, up to 18 by 2·2 μ; and wreaths of straight, rod-shaped, isodiametric, continuous, biguttulate, hyaline pycnospores, rounded at both ends and measuring 3 to 4·5 by 0·6 to 1 μ. Latin diagnoses are given of this species, as well as of the closely related *Endothiella* stage (*Endothiella gyrosa* Sacc.) of *Endothia gyrosa* (Schw.) Fries and the pycnidial stage of *E. fluens* (Schw.) S. & S. Pending the development of the perithecial stage, the oak parasite cannot be definitely identified, but it appears to agree most closely with *Endothiella gyrosa*. Inoculation experiments with mycelium and pycnospores from pure cultures were most successful when carried out in April and May or October through wounds in the phelloderm of the trunk and branches, the incubation period ranging from three months to a year. Inoculation tests on other oaks (*Q. lusitanica*, *Q. toza*, and *Q. humilis*), chestnut (*Castanea dentata*), *Eucalyptus diversicolor*, and almond also gave positive results, while elm (*Ulmus glabra*), ash (*Fraxinus angustifolia*), and willow (*Salix viminalis*) failed to contract infection.

'Coal disease' is much more common than orange 'rust' and has been found attacking oaks, planes [*Platanus*], beeches, and chestnuts. The initial symptom of infection on the cork oak is a moist canker whence a dark excretion smelling of fermented tannin is exuded. On trees enfeebled by various causes the progress of infection is unusually rapid, destroying all the cork-producing zone, for which is substituted a hard, black, shiny substance of a stromatoid consistency, which gradually cracks the cortex and separates it from the trunk. A carbonaceous layer of stromatic fungal tissue may eventually cover, underneath the

cortex, the entire trunk and branches down to the smallest twigs. The round, shiny perithecia with numerous protuberances are clearly visible to the naked eye. Saccardo's Latin diagnosis of *N. regia* is given. Inoculation experiments gave positive results on wounded cork oaks, the incubation period being two to three months at the most.

Trees attacked by *E. gyrosa* should be decorticated and the trunk scorched, the implements being dipped after use in an antiseptic. In cases of severe infection by *N. regia* the trees should be burnt; local cankers may be excised and the resulting wound washed with a 5 per cent. solution of chloride of lime and then covered with a paste of linseed and copper dust, Bordeaux paste, or some similar material.

VANINE (S. I.). Грибные повреждения Бука (**Fagus orientalis**) и влияние их на качество древесины. [Fungal decays of the Beech (*Fagus orientalis*), and their effect on the quality of the wood.]—*Scient. Papers Inst. Engin. of Ways of Communication in Leningrad*, 111, 39 pp., 15 figs., 1932.

In this paper the author gives a brief account of the symptoms of the chief fungal rots that attack the beech (*Fagus orientalis*) in the Union of Soviet Republics, and also brief morphological descriptions of 24 species of Basidiomycetes usually found in association with these rots. Short diagnoses in Russian are further given of seven species of fungi that cause discoloration of beech timber, namely, *Bispora monilioides* Cda., *Stysanus stemonites* [cf. *R.A.M.*, xi, p. 80], *Bulgaria polymorpha* [ibid., viii, p. 425], *Lasiosphaeria hispida*, *Trematosphaeria hydrella*, *Rosellinia ambigua*, and *R. pulveracea*. Considerable space is given to a discussion of the physical and mechanical properties of sound beech wood, and of those of the timber in various stages of decay.

SERVAZZI (O.). **Su una batteriosi del Pioppo canadense.** [On a bacteriosis of Canadian Poplar.]—*La Difesa delle Piante*, ix, 1, pp. 8–9, 1932.

A brief, popular account is given of a disease of Canadian poplars [*Populus canadensis*] noted in 1931 in Italy and which the author states is due to *Micrococcus populi* [*R.A.M.*, x, p. 567]. The condition affected the trunks of trees 3 to 5 years old and the young branches of adult trees. Rust-coloured spots measuring 6 to 10 by 4 to 6 cm. appeared in March, and the bark gradually swelled until soft tumours formed, which broke on pressure from the finger, emitting a colourless liquid containing bacteria. Later, the tumours cracked longitudinally and burst through the periderm, laying bare restricted areas of the cortical parenchyma and phloem and giving rise to elongated wounds [cf. ibid., x, p. 68], round which a cicatrization ring quickly formed; the affected bark turned brown and the surface of the wood became slightly yellow.

Usually, the first cicatrization ring suffices to arrest the progress of the disease, which is always restricted to limited portions of the bark, the wood being protected by cork which forms below the peripheral swelling. In a few cases, new swellings develop round

the original one, the wound becomes an open canker, and severely affected branches are killed.

As the disease usually quickly becomes arrested it need arouse no alarm. The external lacerations and tumours do not interfere with the growth of the trunk, and if the canker-like areas are small, after a few years they appear only as small, superficially cracked protuberances surrounded by a narrow ring.

Should the attack appear likely to become at all serious, the tumours should be promply removed, and the wounds disinfected with a 5 per cent. solution of iron sulphate, afterwards being painted over with tar.

FRANCHINI (G.). **Étude sur un flagellé spécial du latex d'un Figuier de l'Érythrée (Ficus hochstetteri (Mg.) A. Rich).** [A study of a specific flagellate of an Eritrean Fig (*Ficus hochstetteri*) (Mg.) A. Rich).]—*Bull. Soc. Path. Exot.*, xxiv, 9, pp. 843–848, 2 figs., 1931.

In the latex of *Ficus hochstetteri*, specimens of which were sent from Asmara, Eritrea, to the Institute of Colonial Pathology, Modena, the writer found a flagellate differing from other plant parasites of this nature in its greater length (up to 70 μ including the flagellum, by 0·7 to 1·5 μ broad). Aflagellate forms were also observed; they were oval or elongated, occasionally Leishmaniform (furnished with a nucleus and blepharoplast). The aflagellate forms were arranged in chains while the flagellates were isolated or occurred in groups of two or four with the posterior extremity in the centre and the anterior (flagellate end) free. Division originates in the blepharoplast and proceeds transversely instead of longitudinally, as in the majority of flagellates parasitic on plants. The organism is named *Herpetomonas* (*Leptomonas*) *ganorae* n. sp.

HUMPHREY (C. J.) & LEUS (SIMEONA). **Studies and illustrations in the Polyporaceae. II. Fomes pachyphloeus Patouillard and Fomes magnosporus Lloyd.**—*Philipp. Journ. of Sci.*, xlvii, 4, pp. 535–556, 10 pl., 1932.

Fomes pachyphloeus [*R.A.M.*, x, p. 165; xi, p. 106], the taxonomy and synonymy of which is discussed and the morphological characters fully described, is reported to be a vigorous wood-destroyer in the Philippines, where it is often found on dead standing trees and fallen trunks and occasionally produces an extensive heart rot in mature or over-mature living trees of the more perishable species. The following hosts have been identified in the islands: *Albizzia procera*, *Ficus* sp., *Hopea acuminata*, *H. philippinensis*, *Parashorea malaanonan*, *Parkia javanica*, *Pentacme contorta*, *P. mindanensis*, *Rhizophora candelaria*, *R. mucronata*, *Shorea guiso*, and *S.* sp.

HEMMI (T.). **Studies on some wood-destroying fungi attacking conifers in Japan.**—*Mem. Coll. Agric. Kyoto Imper. Univ.*, 20 (Phytopath. Ser., 5), 29 pp., 5 pl., 7 figs., 1932.

A comprehensive account is given of the author's morphological and physiological studies of conifer rots in Japan, of which three

types may be distinguished, viz., brown cubical rot, represented by *Fomes laricis* [*R.A.M.*, x, p. 571] on larch (*Larix leptolepis* and *L. dahurica*) and *Abies sachalinensis*, *F. pinicola* [ibid., x, p. 700] on *A. firma*, *Tsuga sieboldi*, *Pinus densiflora*, and other hosts, and *Polyporus schweinitzii* and *P. sulphureus* on *Abies*, *Picea*, *Pinus*, and *Larix* spp.; brown pocket rot (*F. ulmarius* on *Cryptomeria japonica*) [ibid., ix, p. 421]; and white pocket rot (*Trametes pini* on *A. sachalinensis*, *Picea jezoensis*, and *L. dahurica*, and *Polyporus orientalis* on *Pinus densiflora* and *P. thunbergii*) [ibid., viii, p. 210].

The examination of a specimen of *F. ulmarius* from an elm tree at Kew showed that the causal organism is identical with that causing the heart rot of *C. japonica* in Japan, while the whitish fruit bodies collected in various parts of Japan on *Aphananthe aspera*, *Celtis sinensis*, *Cinnamomum camphora*, and *Abelicea hirta* are also believed to belong to the same fungus.

EADES (H. W.). **British Columbia softwoods: their decays and natural defects.**—*Dept. of the Interior, Canada, Forest Service Bull.* 80, 126 pp., 60 pl. (18 col.), 3 figs., 17 diags., 1932.

This valuable monograph on the fungous rots and other natural defects of conifers in British Columbia is stated to be the result of insistent inquiries from the timber industry for comprehensive and graphic information concerning the appearance and importance of the various types of decay, staining, and blemishes encountered in the work of grading. As far as possible the text has been written in non-technical language. The subjects dealt with include the general anatomy and physiology of a tree; a description of British Columbian softwoods; wood-inhabiting fungi; the recognition of defects caused by stain and decay; a description of the chief wood-rotting fungi of the province; and the durability of coniferous timber.

The following organisms are responsible for damage to standing timber. *Trametes pini*, the cause of a white pocket rot of Douglas fir (*Pseudotsuga taxifolia*), spruce, pine, and other softwoods, is stated to be the most widespread of all the wood rots of North America [*R.A.M.*, x, p. 570 and next abstract], followed by *Polyporus schweinitzii*, known as the velvet top fungus or red-brown butt rot. The chalky quinine or larch fungus (*Fomes officinalis*) [*F. laricis*] attacks both standing trees of Douglas fir and western yellow pine (*Pinus ponderosa*) and also the timber from them, developing on bridge work, mine timbers, factory roofs, and the like. Most of the purple or red staining of Douglas fir heartwood is attributable to this fungus. *Polyporus sulphureus* causes a brown cubical rot which is most prevalent among the true firs (*Abies* spp.). The Indian paint or stringy brown rot fungus (*Echinodontium tinctorium*) also chiefly affects the true firs but is very severe on western hemlock (*Tsuga heterophylla*). Standing trees are seldom infected by the red-brown sapwood or belt rot due to *F. pinicola* which is, however, the chief cause of decay of 'down' timber or unused logs in the coastal region, where pines, Sitka spruce (*Picea sitchensis*), western larch (*Larix occidentalis*), Douglas fir, and western hemlock are all liable to attack. The rot

produced by *F. roseus* on Douglas fir and other conifers is similar to that caused by *Polyporus schweinitzii*. *F. annosus* is relatively unimportant on conifers in British Columbia as compared with the eastern part of North America or Europe, though all species are subject to occasional attack. Western yellow pine is frequently infected by *P. ellisianus*, known as red ray wood rot, red heart, red rot, grey rot, and top rot. *Ganoderma oregonense* [ibid., viii, p. 541], occurring along the Pacific coast from California to Alaska, causes a light, spongy, straw-coloured rot with numerous large, black spots and ramifying lines on Sitka spruce, Douglas fir, and western hemlock. Most of the butt rot in western red cedar (*Thuja plicata*) may probably be attributed to *Poria weirii*.

Notes are also given on some of the fungi found only on the timber after felling (not on the standing trees), and on the damage caused by sap-staining fungi.

Boyce (J. S.). **Decay and other losses in Douglas Fir in western Oregon and Washington.**—*U.S. Dept. of Agric. Tech. Bull.* 286, 59 pp., 11 pl., 2 figs., 11 graphs, 1 map, 1932.

Continuing his extensive studies on the causes of decay in the valuable Douglas fir (*Pseudotsuga taxifolia*) stand of the Pacific North-West, with special reference to fungous rots [*R.A.M.*, iii, p. 115], the author made a detailed examination of the losses sustained from 1921 to 1924, inclusive, on 38 plots covering 77·79 acres and containing 2,633 trees with a total volume of over 10,146,000 board ft. or 1,571,000 cu. ft. The results of the investigations [which are tabulated and discussed at length] showed that the total loss over the area under observation amounted to 27·77 per cent. in board ft. volume and 23·25 per cent. in cu. ft. volume, of which 16·99 and 9·50 per cent., respectively, were due to rotting.

Of the loss from decay, red ring rot (*Trametes pini*) [see preceding abstract] was responsible for 80·8 per cent. of the board ft. volume loss; brown trunk rot (*Fomes laricis*) for 8·6 per cent.; red-brown butt rot (*Polyporus schweinitzii*) for 6·2 per cent.; yellow-brown top rot (*F. roseus*) for 4·1 per cent.; and pitted sap rot (*Polystictus abietinus*), spongy sap rot (*F. annosus*), and unknown rots for 0·1 per cent. each. The corresponding figures calculated to the cu. ft. volume are given. The heaviest losses in any one plot amounted to 54·8 per cent. in board ft. volume and 32·2 per cent. in cu. ft. volume, nearly all caused by *T. pini*. The latter was observed attacking a 27-year-old tree, while *Polyporus schweinitzii*, *F. roseus*, and *F. laricis* occurred on individuals of 73, 76, and 146 years, respectively. Generally speaking, the incidence of decay was found to increase rapidly in mature and overmature stands, and data resulting from the present observations will find an important use in determinations of the correct periods for felling operations so as to save the maximum amount of mechantable timber.

Spaulding (P.) & Hansbrough (J. R.). **Cronartium comptoniae, the Sweetfern blister rust of Pitch Pines.**—*U.S. Dept. of Agric. Circ.* 217, 21 pp., 2 figs., 1 diag., 2 maps, 1932.

The sweetfern blister rust (*Cronartium comptoniae*) [*R.A.M.*, ix,

p. 145] of pitch pine (*Pinus rigida*) has been found to attack many two- and three-leaved pines in the United States and British Columbia, including *P. banksiana, P. contorta, P. echinata, P. jeffreyi, P. montana, P. nigra, P. ponderosa, P. pungens, P. resinosa, P. sylvestris, P. taeda,* and *P. virginiana.* It has caused serious damage in a number of nurseries in the northern States, and neither sweetfern (*Comptonia asplenifolia*) nor sweetgale (*Myrica gale*), another alternate host of the rust, should be tolerated within several hundred yards to a mile of pine plantings. *M. carolinensis* has been successfully inoculated with *C. comptoniae* but does not appear to contract infection in nature.

Ohara (K.) & Adachi (K.). **Über die Zersetzung der Holzzellwände durch Pilzfäden.** [On the dissolution of the cell walls of wood by fungus hyphae.]—*Bot. Mag.*, Tokyo, xlvi, 544, pp. 345–352, 1 fig., 1932. [Japanese, with German summary on pp. 262–263.]

No topographical modification of the cell wall structure near the points of entry of the hyphae could be detected in the wood of *Picea jezoensis* attacked by *Trametes pini* (white pocket rot) and of *Cryptomeria japonica* infected by *Fomes ulmarius* (brown pocket rot) [see above, p. 614] on staining with chlorzinc iodine, sulphuric acid and iodine, or phloroglucin-hydrochloric acid. Oxamin 4 R stains the marginal zone blue and the remaining portions of the cell walls red in both cases, indicating that the submicroscopic structure of the cell walls undergoes a change near the points of entry of the hyphae.

Vanine (S. I.). Синева древесины и меры борьбы с нею. [Blue stain of timber and measures for its control.]—104 pp., 48 figs., Гос. издат. С.-хоз. и Колхозно-Кооп. Литературы. [State Publishing Office of Agric. and Collective Farming Co-operative Literature], Leningrad, 1932.

This is a monograph, compiled from Russian and foreign researches, of the various fungi associated with the so-called blue staining of timber in the northern hemisphere. Of the 42 species briefly described and illustrated, the following appear to occur within the Russian Soviet Republics [cf. *R.A.M.*, x, p. 143], namely: *Ceratostomella buxi* on boxwood [*Buxus* sp.]; *C. castaneae* on chestnut, oak, and beech; *C. coerulea, C. piceae,* and *C. pini* on conifers; *Lasiosphaeria spermoides* on the wood of broad-leaved trees; *Rosellinia abietina* var. *trichota* on coniferous timber; *R. pulveracea* on broad-leaved species, especially oak timber; *Aposphaeria petersii*, found sporadically on telegraph poles; *A. pinea*, frequent on standing dead pines killed by forest fires and causing a deeply penetrating bluish-grey discoloration of their wood; *Ligniella pinicola* on windfalls of coniferous trees; *Coniothyrium dispersellum* on pines and firs; *Cladosporium herbarum* on coniferous timber; *Hormiscium antiquum* on birch and other deciduous timber; *Hormonema dematioides* very frequent on pine and fir logs kept for a long time in the forests; *Sirodesmium granulosum* on old chestnut and other deciduous timber; *Sporodesmium cladosporii* on coniferous wood; *Trichosporium ligni-*

colum on pinewood; and *T. tingens* very frequent on aspen timber.

The remainder of the paper is a summarized account of the behaviour of the various fungi under natural and controlled conditions, and of the damage done by them to timber. Control measures, most of which are of a preventive nature, are discussed in considerable detail, and recommendations are given for the handling of the logs from the time of their felling to their industrial application.

CUMMINS (J. E.). **The preservative treatment of fence posts. (With particular reference to Western Australia.)**—*Australia Council Sci. & Indus. Res. Pamphlet* 24, 34 pp., 8 figs., 1932.

After a reference to the increasing shortage in Australia of hardwood timber for fencing purposes, the author briefly describes in popular language the chief preservative treatments of the more perishable kinds of fence poles. The methods of treatment discussed are the pressure, open tank, steeping, dipping, and brushing processes, of which the open tank method is recommended as the most suitable [*R.A.M.*, xi, p. 488]. Among the various types of preservatives described, creosote with fuel oils is stated to be the best for use in the wetter localities, besides being easier and simpler to apply than water-soluble preparations. The latter, e.g., sodium fluoride with white arsenic [arsenious oxide], or zinc chloride with white arsenic, give good service in drier localities, their choice being a question of price and availability. Although no data are yet available regarding the useful life of treated fence posts for the species of timber existing in Western Australia, there are reasons to believe that properly creosoted posts will last at least 20 to 25 years, and posts treated with the water-soluble preservatives will give a life closely approximating this in dry places. Tables are given indicating the cost of the treatments for various species of timber, and it is computed that if for an untreated post costing 2*d.* to cut and 1*s.* to set, and lasting seven years, the cost per year of life is about $2\frac{1}{2}$*d.*, this charge will be reduced to about $1\frac{1}{2}$*d.* per year for a creosoted post lasting 20 years, and to about $1\frac{3}{4}$*d.* for a post treated with either of the water-soluble preparations and lasting 15 years.

RAMSEY (G. B.) & LINK (G. K. K.). **Market diseases of fruits and vegetables: Tomatoes, Peppers, Eggplants.**—*U.S. Dept. of Agric. Misc. Publ.* 121, 44 pp., 11 col. pl., 1932.

In this, the second paper of this series [*R.A.M.*, xi, p. 467], the authors deal on the same lines as in the previous one with the parasitic diseases of tomatoes, peppers (*Capsicum annuum*), and eggplants in the United States. The bibliography appended comprises 115 titles.

ZAUMEYER (W. J.). **Comparative pathological histology of three bacterial diseases of Bean.**—*Journ. Agric. Res.*, xliv, 8, pp. 605–632, 16 figs., 1932.

This is the full account, of which an abstract has already been

noticed [*R.A.M.*, x, p. 422], of the author's comparative study of the histological lesions caused in the bean (*Phaseolus vulgaris*) by bacterial blights, namely, *Bacterium flaccumfaciens*, *Bact. phaseoli*, and *Bact. medicaginis* var. *phaseolicola* [see next abstract].

PITTMAN (H. A.). **Bacterial blight of Beans. Disease-free seed and disease-free soil essential for control.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., ix, 1, pp. 144–148, 2 figs., 1932.

This is a brief popular account of the etiology and control of the bacterial blight of French beans (*Phaseolus vulgaris*) in Western Australia which was first observed there in 1930–31, since when it has spread to a dangerous extent. Although the causal organism has not yet been definitely established, it appears probable that at least the major part of the losses is attributable to *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xi, p. 418 and preceding abstract].

SCHREIBER (F.). **Resistenzzüchtung bei Phaseolus vulgaris.**] [Breeding for resistance in *Phaseolus vulgaris*.]—*Phytopath. Zeitschr.*, iv, 4, pp. 415–454, 1932.

A full account, supplemented by 45 tables, is given of the author's experiments at the Halle Plant Breeding Institute in the development of bean (*Phaseolus vulgaris*) varieties resistant to *Colletotrichum lindemuthianum* [*R.A.M.*, xi, p. 277].

Twenty plants of each of 57 bush bean varieties were inoculated with 53 isolations of the fungus. Each lot comprised 1,140 plants, a total of 60,420 of which were thus tested. Further, 5,520 F_3 and 1,032 F_2 plants were examined for their reaction to the fungus. Thirty-four physiologic strains of *C. lindemuthianum* were differentiated on the basis of these trials and classified in three main groups (shown by a key), each of which contains one of the American strains of Barrus and Burkholder [ibid., iii, p. 110]. About half the tested varieties were completely susceptible, while of the remainder the Sugar Pearl beans were conspicuous for their resistance. The Cornell selection 'Anthracnose-resistant dry shell Pea Bean No. 22' proved immune from 30 of the *C. lindemuthianum* strains tested, and highly resistant to the other four.

The inheritance of resistance to the bean anthracnose organism is on the basis of three main genes, one for each of the main strain groups of the parasite. Crosses between completely susceptible and completely resistant varieties segregate in the F_2 on testing with one group of physiologic strains in monomerous fashion as 3 : 1, with two groups in dimerous (9 : 7), and with all three groups in trimerous (27 : 37). The combination of resistance to anthracnose with various desirable qualities of colour, shape, and habit of growth was found to be quite practicable.

BRUNER (S. C.) & ARANGO (O.). **La enfermedad 'verruga' de las Habas de Lima.** [The 'scab' disease of Lima Beans.]—*Cuba Sec. Agric., Com. y Trab., Estac. Exper. Agron. Circ.* 74, 38 pp., 4 pl. (1 col.), 1 graph, 1931.

Scab (*Elsinoe canavaliae*) of Lima beans (*Phaseolus lunatus*) is

stated to have been present in Cuba [*R.A.M.*, x, p. 701] for at least 15 years, but for some time it was confused with anthracnose [*Colletotrichum lindemuthianum*: ibid., ix, p. 756]. Counts made on 225 plots of the most commonly grown Challenger beans from November, 1930 to 7th April 1931, showed that the average incidence of infection during this period was about 58 per cent., the figures for each month being as follows: November 9 per cent., December 7, January 36, February 94, March 98, and April 95. The rainfall in December, when infection was lowest, was only 34·8 mm., compared with 103·9 mm. in March, when the disease reached a climax; the mean temperature was approximately 21° C. in both months. There seems to be no appreciable difference in the reaction to scab of the Challenger (pole) and the Fordhook (bush) varieties, the two kinds grown in Porto Rico. The only other plant found infected by *E. canavaliae* is the indigenous or naturalized wild Lima bean.

FIFE (J. M.). **A method of artificially feeding the Sugar-Beet leafhopper.**—*Science*, N.S., lxxv, 1948, pp. 465–466, 2 diags., 1932.

Carter's apparatus for the artificial feeding of the sugar-beet leafhopper (*Eutettix tenella*) [*R.A.M.*, viii, p. 83] having proved unsuitable for certain biochemical investigations of the curly top problem, a method was devised whereby small amounts of solutions of known composition were dropped on to the outside of paraffin membranes, cut into sections 60 μ in thickness, at one end of a piece of glass tubing, the other end of which was covered with cheese-cloth so that the tube served as a cage for the insect, which was found readily to feed on the drop through the paraffin membrane. Hydrogen-ion determinations made on a large number of leafhoppers showed that the material injected into the drop of liquid by the insect is very alkaline. Moreover, a drop of thymol blue (made acid) would turn from lemon yellow to deep green and in some cases to blue within three minutes after the leafhoppers started to feed. A special contrivance [details of which are given] was also arranged to facilitate the study of a coagulable material ejected by the leafhoppers during the feeding process.

TAVEL (CATHERINE V.). **Zur Speziesfrage bei einigen Allium-bewohnenden Uredineen.** [On the species question in some Uredineae occurring on *Allium*.]—*Ber. Schweiz. Bot. Gesellsch.*, xli, 1, pp. 123–170, 2 pl., 7 graphs, 1932.

This is an expanded account, accompanied by 28 tables, of the author's studies on the taxonomy and biology of three autoecious Uredineae occurring on *Allium* spp., viz., *Puccinia allii*, *P. porri*, and *Uromyces ambiguus*, a preliminary note on which has already appeared [*R.A.M.*, x, p. 153].

GÖLLNER (J.). **A Colletotrichum lagenarium egyik új alakjáról.** [On a new stage in the life-history of *Colletotrichum lagenarium*.]—*Bot. Közlemén.*, xxix, 1–4, pp. 73–75, 1 fig., 1932. [German summary.]

The writer's detailed investigations on the life-history of *Colletotrichum lagenarium* [see next abstract] showed that the fungus

penetrates the epicarp of the melon through a wound, spreads intercellularly through the mesocarp, and proceeds to form a sporiferous stroma. Meanwhile the substromatal mycelium continues to develop and rises left and right as if to envelop the stroma, which constantly thickens with the formation of new conidiophores. This encircling mycelium is profusely developed and of a vivid brown colour, extending more than half way up the stroma, the upper part of which is thereby contracted and almost covered in. Hence the originally parallel conidiophores converge and the conidial layer is transformed into a pseudopycnidium, with an opening through which are discharged the abundant conidia. The pore may reach a quarter, a third, or half the diameter of the pseudopycnidium. The latter, like the free conidial layers, contains sterile hyphae (setae). The pseudopycnidia project from the epidermis more than the stromata, even before opening.

The pseudopycnidium is regarded as a stage in the life-history of *C. lagenarium* with the specific purpose of facilitating the rupture of the epidermis and thereby promoting the rapid liberation of the conidia. The organ in question was more commonly found in melon varieties with a thick cuticle than in thin-skinned ones which rupture more readily. The sheath of the pseudopycnidium measures 4·8 to 7·1 μ in thickness, and the diameter of the pseudopycnidia is 97 to 117 μ, height 78 to 146·3 μ, pore 39 to 68·3 μ.

GÖLLNER (J.). **Über die Anthracnose der Melone.** [On anthracnose of the Melon.]—*Thesis*, Debrečen, 40 pp., 2 pl., 1930. (Hungarian.) [Abs. in *Bot. Centralbl.*, N.F., xxi, 3–4, pp. 112–113, 1932.]

The anthracnose of melons due to *Colletotrichum lagenarium* [*R.A.M.*, xi, p. 422 and preceding abstract] is most destructive in Hungary on the fruit of thin-skinned varieties growing in loose, sandy soils; the disease is favoured by a low temperature (12° to 14° C.). The incubation period is 4 to 5 days when the skin is wounded, 8 to 10 when uninjured. The conidia retained their infective capacity after exposure to a temperature of 0° during the winter. Conidia from sugar melons infected watermelons and vice versa. The fungus grows intercellularly below the epidermis of the affected organs; pycnidia and sclerotia of the type described by Rodigin [ibid., viii, p. 624; ix, p. 759] were not observed by the writer. It is injurious not only as a primary parasite but also as preparing the way for *Fusarium niveum* [ibid., xi, p. 557]. Conidial germination was most profuse in distilled water or 1·2 per cent. agar with 3 per cent. dextrose or melon extract (P_H 5 to 7·3).

KORDES (H.). **Sclerotinia sclerotiorum und Botrytis cinerea an Treibhausgurken.** [*Sclerotinia sclerotiorum* and *Botrytis cinerea* on greenhouse Cucumbers.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, x, 1–2, pp. 20–23, 3 figs., 1932.

Greenhouse cucumbers of the Spotfree and Spiers varieties at Neustadt-an-der-Haardt, Germany, were severely attacked in

March, 1931, by *Sclerotinia sclerotiorum* [*R.A.M.*, iv, p. 323; vi, p. 457; viii, p. 155], which destroyed the cortical tissues and vascular bundles of the stem for a distance of 5 to 10 cm. above soil level, covering the affected part with a dense, white mycelium. The supply of water to the upper portions of the plant was thus interrupted and complete wilting ensued. Infection spread rapidly in consequence of the excessively high temperature and stagnant humid atmosphere of the greenhouse. By cutting off the diseased parts of the stem and the application of tree wax to the wounds it was possible to retard the death of the plants for a considerable time, and in mild cases further injury was entirely obviated by this treatment. In the same block the fungus occurred also on the young fruits, which turned yellow and wilted. Numerous sclerotia developed within a few days at 18° C. No genetic connexion could be traced between *S. sclerotiorum* and *Botrytis cinerea*, which occurred extensively on the fruits in the same house.

MILLER (J. H.) & HARVEY (H. W.). **Peanut wilt in Georgia.**—*Phytopath.*, xxii, 4, pp. 371–383, 3 figs., 1932.

Investigations were conducted in 1931 to determine the identity of the fungi responsible for a very common wilt of groundnuts in Georgia. *Fusarium martii* var. *phaseoli* [*R.A.M.*, x, p. 161], apparently not hitherto recorded on this host, was found to be the agent of a seedling wilt that depleted the stand by 10 to 38 per cent. in Clay and Early counties.

Bacterium solanacearum [ibid., x, p. 775] causes a wilt of young plants but in older plants the term 'yellows' is more descriptive of the results of infection by this organism. If the attack is severe the plants may be killed. *Diplodia natalensis* may be found in association with a collar and root rot in fields infected by *Bact. solanacearum*, but all inoculations with it failed. *Sclerotium rolfsii* is a common cause of root and stem rot, especially rather late in the season. It also attacks and rots the nuts, and appears to be most severe in fields much affected by early wilt on sandy lands. The best method of control of these diseases appears to be the cultivation of varieties resistant to *Bact. solanacearum* and *S. rolfsii*, e.g., Alabama Runner, in place of the susceptible White Spanish.

KUFFERATH (H.) & GHESQUIÈRE (J.). **La mosaïque du Manioc.** [Cassava mosaic.]—*Comptes rendus Soc. de Biol.*, cix, 12, pp. 1146–1148, 1932.

Previous investigations by the second-named author showed the presence in the Belgian Congo of a mosaic disease of cassava (*Manihot utilissima*), and also of *M. aipi* and *M. glaziovii* [*R.A.M.*, ix, p. 19; xi, p. 20; see also ibid., xi, p. 152]. The disease was found to be transmissible by Aleyrodideae, and healthy cuttings at the Laeken (Brussels) Colonial Garden were successfully inoculated with sap from the mosaic plants.

[UPPAL (B. N.).] **Grape diseases in the Bombay Presidency.**—*Bombay Dept. of Agric. Leaflet* 8 of 1931, 4 pp., [? 1931. Received June, 1932].

Popular notes are given on the symptoms of the following diseases

affecting grapes in the Bombay Deccan: downy mildew (*Plasmopara viticola*), powdery mildew [*Uncinula necator*: *R.A.M.*, ix, p. 505], and anthracnose [*Gloeosporium ampelophagum*]. The problem of control is practically restricted to *U. necator*, since the other two fungi mentioned suffer from the long periods of drought that occur during the fruiting season of the grape in the district in question. Experiments have shown that the best time for 'cold weather' pruning is the first fortnight of October, while four applications of a fungicide should ensure a satisfactory yield, Bordeaux mixture 5–5–50 being given when the shoots are 6 to 8 in. long, sulphur dust (20 lb. per acre) two to three days after the mixture has dried on the leaves, and the same at the rate of 30 lb. per acre at the time of blossoming and again about forty days later.

MEYER (A.). **Sur l'emploi des colorants et de diverses substances organiques dans la lutte contre les maladies cryptogamiques, en particulier le mildiou de la Vigne.** [On the use of dyes and various organic substances in the control of cryptogamic diseases, particularly Vine mildew.]—*Rev. de Vitic.*, lxxvi, 1970, pp. 197–202, 1932.

In this paper the author briefly indicates the results of a series of preliminary experiments carried out in 1930, on his instigation as an outcome of Truffaut's and Pastac's recent investigation of the fungicidal action of chemical dyes [*R.A.M.*, x, p. 432; xi, pp. 221, 525], by some vine-growers of the Côte-d'Or on the control of vine mildew [*Plasmopara viticola*]. The following dyes were tested: malachite green, brilliant green, rhodamine B, safranin, acridine yellow, auramine, and yellow pyoctanine. Tests of quinosol [cf. ibid., viii, p. 588; x, p. 138] and sunoxol of the oxyquinoline group of organic substances were also made. While pointing out the provisional nature of the results, particularly in view of the severity of the outbreak of mildew in that year which in some cases masked the efficacy of the treatments, it is stated that of the dyes the best curative effect was obtained with auramine, pyoctanine, acridine yellow, and safranin, the first two also having apparently given the best protection to the vine foliage against the fungus, since vines treated with them remained free from the disease longer than neighbouring plots that had been sprayed several times with cupric preparations. Particularly promising results were obtained with quinosol and sunoxol, both of which were effective as prophylactic and curative remedies at much higher dilutions than the dyes. The spreaders used with all the substances were either brecolane N of the Établissements Kuhlmann or oranit BX of the Établissements Beycopal.

RAVAZ (L.). **Chronique. Le mildiou.** [Current events. Mildew.]—*Prog. Agric. et Vitic.*, xcvii, 16, p. 381, 1932.

The heavy rains (5 to 24 mm.) which fell between the 1st and 4th April, 1932, in combination with temperatures ranging up to 20° C., in the region of Montpellier caused, in exposed places, a very abundant germination of the winter spores of vine mildew [*Plasmopara viticola*]. These observations led the Agricultural

College of Montpellier on the 7th April to issue a warning of an impending outbreak of the disease towards the 13th or 14th of that month, especially in low-lying vineyards flooded by the rains, and on vinestocks trained low. It is pointed out that, with the exception of 1931, when the first wave of infection occurred on the 1st of April, this is the earliest invasion of the fungus so far recorded in the region.

RAVAZ (L.). **Chronique. Sur la pourriture grise précoce.** [Current events. Note on early grey rot.]—*Prog. Agric. et Vitic.*, xcvii, 16, pp. 377–380, 1932.

The author states that the examination early in 1932 of a small lot of dormant vine runners (variety Pinot) from Champagne showed that, besides the presence of fructifications of common saprophytic fungi, the twigs presented pale yellow or almost white discolorations of the cortex, occasionally bearing sclerotia. When placed under adequate conditions of humidity and temperature, these spots were rapidly covered with an abundant aerial mycelium, at first white but later turning brown, and indubitably belonging to *Botrytis cinerea*. Although the fungus apparently did no serious injury to the twigs, its presence on the latter is a dangerous source of infection to young developing shoots, which, especially in wetter areas, such as the north-east, centre, and south-west of France, are sometimes severely attacked by it during rainy spells; the vine inflorescences may also be infected from their very inception and until the end of the flowering period, with consequent partial or total destruction of the racemes. Laboratory experiments indicated that the fungus may be removed from the twigs by swabbing or spraying them, while still dormant, with a 10 per cent. sulphuric acid or a 40 per cent. sulphate of iron solution.

PRESTON (N. C.). **Part I. Report of the Advisory Mycologist, April, 1931–March, 1932.**—*Rept. Advisory Dept. Harper Adams Coll., Newport, Salop*, 7, 30 pp., 1 fig., 1932.

Root rot (*Aphanomyces euteiches*) [*R.A.M.*, x, p. 422], which was first recorded on peas in Warwickshire during 1929–30, caused extensive damage in the year under review in the Avon Valley, and was observed on one field crop in Shropshire. *Thielavia basicola* was also reported as a cause of failure in garden peas [ibid., viii, p. 622].

Seedling oats were severely damaged by *Fusarium culmorum* and *F. avenaceum* [ibid., ix, p. 586; x, p. 784], while an ear blight of wheat, also caused by a species of *Fusarium*, was injurious locally.

Verticillium vilmorinii [ibid., iv, p. 289; x, p. 758] caused exceptionally heavy damage on Michaelmas daisies in Staffordshire.

The effect of the application of hydrated lime on small plots at the rate of 2 tons per acre (which brought the soil reaction slightly above P_H 7) on finger-and-toe [*Plasmodiophora brassicae*] in turnips was to increase the average weight of the crop per plot from 5·2 to 68·3 lb. while the percentage of badly diseased roots was reduced from 70 to 46.

Zpráva o škodlivých činitelích kulturních rostlin v Republice Československé v roce 1930–1931. [Report on the agencies injurious to cultivated plants in the Republic of Czecho-Slovakia in the year 1930–31.]—*Ochrana Rostlin*, xii, 1–2, pp. 1–63, 5 figs., 1 graph, 1932.

In this series of annual reports of the diseases of the chief agricultural crops in Czecho-Slovakia [cf. *R.A.M.*, xi, p. 157] Šeda states that early in the spring of 1931 cereals suffered very heavily from the so-called winter injury (*Fusarium* spp.), more particularly in hilly districts where the snow covering was deep and was late in disappearing; in some localities so many of the seedlings were killed that whole fields had to be resown. There was good evidence that crops raised from disinfected seed were considerably less injured than where this precaution was neglected. The year under review was also conspicuous for a high incidence and severity of cereal smuts, especially wheat bunt (*Tilletia tritici*) [*T. caries*], the development of which was favoured by the climatic conditions of the year which retarded the early growth of the seedlings.

Baudyš states that in Moravia considerable damage was done to red clover [*Trifolium pratense*] by *Fusarium trifolii* [ibid., x, p. 670], this being believed to be its first record for Czecho-Slovakia. In several localities of Moravia lucerne suffered from attacks of *Pionnotes rhizophila* [*F. betae* = *F. merismoides* var. *majus*] on its roots, and peas from attacks of *F. redolens* [ibid., iv, p. 10]. In Silesia, following heavy and frequent rains in August, French beans [*Phaseolus vulgaris*] were severely attacked by *Botrytis cinerea* which not infrequently killed the plants; in Bohemia this crop was chiefly attacked by *F. vasinfectum*, and lupins by a species which is believed to be *F. tracheiphilum*.

Blattný reports a considerable reduction in 1931 in the incidence of the 'kadeřavost' disease of hops [ibid., x, p. 207], and also the entire disappearance of hop mosaic, a few cases of which had been observed in certain commercial hop gardens in Czecho-Slovakia. An infectious sterility of hops (the infectivity of which is not considerable) was rather prevalent in certain localities, and investigations of the disease are in progress. Among the diseases of ornamental plants the following may be mentioned; *Entyloma dahliae* on dahlias [ibid., ix, p. 409]; *Oidium chrysanthemi* on chrysanthemums [ibid., ix, p. 456]; a black stem rot of asters (*Callistephus chinensis*) caused by several species of *Fusarium*, of which *F. pyrochroum* and *F. conglutinans* var. *callistephi* appear to be the most frequent; *Puccinia arenariae* [ibid., x, p. 745] on carnations (*Dianthus barbatus*); and mosaic of hyacinths imported from Holland.

Annual Report of the Department of Agriculture, Jamaica, for the year ended 31st December, 1931.—36 pp., 3 pl., 1932.

The following items of phytopathological interest occur in this report. H. H. Cousins states (p. 2) that in 1930 the annual rate of increase of Panama disease [*Fusarium oxysporum*: *R.A.M.*, x, p. 626] in banana plantations was reduced to 100 and in 1931 to 31 per cent. as compared with 115 per cent. in 1929, the latter abnor-

mally high figure being attributed mainly to the widespread adoption, on outside advice, of the 'one-root' treatment [ibid., x, p. 44]. During the three years previous to 1929 the rate of increase had remained steady at 57 per cent. per annum. Had the continuation of the 'one-root' system been permitted in 1930, it is estimated that the diseased plants would have numbered over a million in 1931, and the reduction of the premier industry of Jamaica to a low standard would have been imminent. For 1932 the estimated number of diseased plants requiring treatment is 130,000, at a cost of £15,333. The discovery by the Microbiologist (F. E. V. Smith) of the efficacy of certain grades of fuel oil in killing banana plants *in situ* is calculated to have reduced the cost of treating Panama disease by about 50 per cent. [ibid., xi, p. 585]. On the Ballards Valley estate the cost of treating 182 cases by the old method of digging out and burning in 1930–1 was 5*s.* 11½*d.* each, against 2*s.* 1¾*d.* for 535 cases by the fuel oil (p. 18). A large number of seedling bananas immune from *F. oxysporum* have been produced and some have already gained commercial acceptance; each time the plants ratoon the fingers become longer and the bunches larger. The most successful crosses, according to J. B. Sutherland (p. 21), are the Gros Michel-Robusta and back-crosses of these to Gros Michel [ibid., xi, p. 25]. It is stated in F. E. V. Smith's report (p. 17) that as a result of the withdrawal of Government control in the Portland district in 1930 [ibid., xi, p. 62], the treatment of bananas against Panama disease was almost completely discontinued, with a consequent rapid increase of infection.

The 'pin-head' black spot was prominent on irrigated banana fruits during the autumn, when a similar spotting was also prevalent in some mountainous districts. These disorders appear to be associated with fluctuations in soil moisture and temperature.

Various types of root disease and gummosis of citrus are common throughout the Island. Reasonably good control of scab (*Sporotrichum citri*) in sour orange [*Citrus aurantium* var. *bigaradia*] nurseries has been given by spraying with Bordeaux mixture [ibid., xi, p. 25], coupled with the eradication of all old sour orange and lemon trees from the vicinity. Knot (*Sphaeropsis tumefaciens*) is common on limes [ibid., ix, p. 63].

A rotting of pineapple plants at soil level appears to be due to *Phytophthora parasitica* [ibid., x, pp. 24, 473].

Mangoes were heavily damaged by mildew (*Oidium* sp.) [? *Erysiphe cichoracearum*: ibid., x, p. 326] attacking the young flowers.

A number of avocado trees in the mountains were killed by black root rot (*Rosellinia* spp.) [ibid., viii, p. 632], while one case of severe leaf infection by *Sporotrichum citri* [*Sphaceloma* sp.: ibid., v, p. 310; ix, p. 726] was recorded.

Mosaic seems to be the limiting factor in the cultivation of papaws on a large scale on the Liguanea Plain [ibid., x, p. 809].

Leaf mould (*Cladosporium fulvum*) and late blight (*P. infestans*) of tomatoes were both prevalent, the latter yielding only to repeated applications of Bordeaux mixture.

The mosaic-immune Java cane P.O.J. 2725 is stated by H. H. Cousins (p. 2) to be rapidly replacing Uba [cf. ibid., xi, p. 603].

MARTIN (W. H.). **Plant pathology.**—*Fifty-second Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1931*, pp. 47–52, 307–316, 1931. [Received July, 1932.]

In a field experiment to determine the relative value of various chemical compounds in the control of potato scab (*Actinomyces scabies*) and *Corticium vagum* [*C. solani*: *R.A.M.*, xi, p. 355] equally good results against the former disease were given by semesan at the rate of 45 lb. per acre and calomel or yellow oxide of mercury, 10 lb. per acre. The two latter compounds were also very effective against *C. solani*. Further investigations to ascertain the effect of varying amounts of lime on the development of scab showed that, in those soils where the fungus has been eliminated by increasing the soil acidity, the addition of lime in quantities sufficient to bring the reaction to a point above P_H 5·3 (3,000 to 4,000 lb. per acre) will result in a scabby crop.

Sweet potatoes from a field severely infested by scurf (*Monilochaetes infuscans*) [ibid., x, p. 403] were divided into three lots, viz., apparently clean, slightly diseased, and heavily infected. Part of each lot was bedded without treating, while the remainder was either immersed for ten minutes in 1 in 1,000 mercuric chloride or for two minutes in 1 in 48 semesan. At the first pulling of sprouts 8·8 per cent. were clean from the untreated clean lot compared with 45·4 per cent. from the untreated slightly and severely infected. At the second pulling the number of clean sprouts from the three lots was 39·1, 26·7, and 27·8 per cent., respectively. On the slightly diseased treated potatoes there was an increase of some 53·3 per cent. in the number of clean sprouts as compared with the untreated, the corresponding figure for the severely infected being 10 per cent.

The pea root rot organism (*Aphanomyces euteiches*) [see above, p. 623] was found to require a minimum soil temperature of about 60° F. and abundant moisture for infection.

The relationship between neutral soils and eggplant wilt (*Verticillium albo-atrum*) was again demonstrated [ibid., x, p. 438]. On acid plots (P_H 4·6 to 4·8) the yield of marketable fruits was 32 per cent. higher than that from limed plots. On the acidified plots 31·2 per cent. of the plants remained free from wilt, compared with 22·9 on the untreated and 1·4 per cent. on the limed.

Partial control of apple scab (*Venturia inaequalis*) on Rome trees was given by spraying with copper oleate and copper hydroxide, but the results were not comparable with those obtained with the standard fungicides tested. Over 90 per cent. of the apples treated with lime-sulphur and flotation sulphur were placed in the first grade.

Observations in ten orchards in Hunterdon County showed an increase in the incidence of peach yellows [ibid., xi, p. 521] of 5 to 40 per cent. in 1930 compared with 1929.

Good control of anthracnose (*Plectodiscella veneta*) on dewberries [*Rubus* sp.] was given by a delayed dormant application of concentrated lime-sulphur 1 in 10, followed by a pre-blossom spray of Bordeaux 2½–5–50, which reduced the incidence of infection from 90 to 10 per cent.

Six strains of *Phytophthora cinnamomi* [ibid., x, p. 12] have

been studied in relation to rhododendron wilt. Two of the strains are decidedly less pathogenic on *Rhododendron ponticum* than the other four, and one of the two has distinct growth characteristics on certain media. Of all the materials used for soil treatments against this disease, the most promising are copper carbonate and inoculated sulphur.

STEIN (EMMY). **Über den durch Radiumbestrahlung von Embryonen erzeugten erblichen Krankheitscomplex der Phytocarcinome von Antirrhinum majus.** [On the hereditary disease complex of the phytocarcinoma of *Antirrhinum majus* induced by radium irradiation of embryos.]—*Phytopath. Zeitschr.*, iv, 5, pp. 523–538, 7 figs., 1932.

An account is given of the writer's genetic and histological studies of four generations of the progeny of an *Antirrhinum majus* embryo in which a disease was induced by exposure to radium rays. From the standpoint of heredity the disease is complex, several hereditary factors for pathogenic processes being apparently involved and becoming manifest in succeeding generations. One of these (which proved to be recessive) has been separated by crossing the diseased progeny with the healthy parent race and is termed 'ca_1' (carcinoma).

The first perceptible symptoms of this systemic disease consist of more or less pronounced degenerative changes in the embryonal and post-embryonal tissues, including the development of giant cells, considerable cytological details of which are given. Any organ may be affected by these alterations, the course of which is rapid and their final result disintegration.

The analogy between these plant 'carcinomata' and those of man and animals rests on the following bases: (1) identity of cellular development; (2) experimental production of similar degenerative changes in plants and animals by the same means (rays with short wave-lengths and tar); (3) the existence of a chromosomal basis as shown by the hereditary analysis of the irradiated *Antirrhinum*. It is concluded that many types of malignant neoplasms, both in the plant and animal kingdoms, rest on the same hereditary bases.

WENIGER (WANDA). **Diseases of grain and forage crops in North Dakota.**—*North Dakota Agric. Exper. Stat. Bull.* 255, 97 pp., 31 figs., 1932.

This is a revision of Bulletin 166 dealing in popular terms with the diseases of cereals and forage crops in North Dakota and their control [*R.A.M.*, ii, p. 498].

SHITIKOVA-ROUSSAKOVA (Mme A. A.). **Особенности распространения спор в воздухе, главным образом спор ржавчины хлебов.** [Peculiarities in the dissemination of spores through the air, with particular reference to cereal rust spores.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 131–140, 2 graphs, 1932. [English summary.]

This is a somewhat amplified version of the author's recent paper on the influence of air currents on the spread and development of cereal rusts on the territory of the Russian Soviet Republics [*R.A.M.*, xi, p. 286].

SHITIKOVA-ROUSSAKOVA (Mme A. A.). Влияние пересадки растений озимой Ржи и Пшеницы на развитие ржавчины. [The influence of transplantation of winter-sown Rye and Wheat plants on the development of rust.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 85–96, 1932. [English summary.]

The experiments described in this paper were designed primarily to determine the effect of transplantation on, and the relationship of density of stand to, the yield and quality of cereal crops, with particular reference to wheat and rye. The investigation, which was carried out during the 1929–30 season in several widely separated regions of Russia, showed that transplantation in the spring of winter-sown rye and wheat plants, by prolonging the period of their early growth, rendered them more susceptible to attacks of rusts [*Puccinia* spp.]; transplantation by mechanical means (Blass transplantor) at first appeared to reduce somewhat the incidence of the rusts, presumably owing to the destruction of one or more of the young leaves, but later the seedlings so transplanted developed fully as much rust as those that were transplanted by hand. It was also found that the incidence and severity of the rusts increased in an almost geometrical ratio with the spacing allowed between the host plants, this fact obviously vitiating the objectives primarily aimed at in the work.

LEVINE (M. N.) & COTTER (R. U.). **Susceptibility and resistance of Berberis and related genera to Puccinia graminis.**—*U.S. Dept. of Agric. Tech. Bull.* 300, 26 pp., 8 figs., 1932.

Some definite knowledge concerning the reaction to stem rust (*Puccinia graminis*) of rather more than 100 established species, varieties, and hybrids of *Berberis* (the synonymy of which is clearly indicated) [*R.A.M.*, xi, p. 352] has been acquired from three sources, viz., (1) the results of artificial inoculations in the greenhouse; (2) observations of natural infections in the field and examination of herbarium material; and (3) studies of the published reports of other workers. The full data are carefully tabulated. The inoculations were made with sporidia of all the stem rust races known in North America, and infection was secured with all except that of timothy (var. *phlei-pratensis*) [ibid., xi, p. 437]. Some 90 per cent. of the species and varieties recognized in this investigation were found to be more or less susceptible to one or several of the strains of *P. graminis*, and only about twelve were immune, including *B. thunbergii* and its variety *atro-purpurea*, *B. repens*, *B. ottawensis* (*B. vulgaris* × *B. thunbergii*), *B. potaninii*, *B. beaniana*, and *B. concinna*. Some of these may prove, on further testing, to be susceptible, but there seems to be little doubt that *B. thunbergii* and *B. repens* are genuinely immune.

FORWARD (DOROTHY F.). **The influence of altered host metabolism upon modification of the infection type with Puccinia graminis tritici p.f. 21.**—*Phytopath.*, xxii, 6, pp. 493–555, 11 figs., 1932.

The exposure of seedlings of eleven standard differential wheat varieties [which are named] to darkness for periods of one to

seven days in some 80 greenhouse tests at Toronto University resulted in changes in the appearance of the leaf tissues; in the type of infection produced by *Puccinia graminis tritici* physiologic form 21 [*R.A.M.*, xi, p. 436]; in the rate of development of the rust; and in some cases, especially with resistant hosts such as Khapli, Vernal, and Einkorn, in the number of pustules and visible infection centres.

Rust development was retarded by darkness, generally for a period exceeding that during which the seedlings were kept in the dark chamber. Seedlings subjected to protracted periods of darkness showed greater resistance, marked by a reduction in size or elimination of the pustules, as well as the appearance of sharply defined flecks of hypersensitive tissue [ibid., iv, p. 153] on ordinarily congenial hosts, such as Little Club, Arnautka, and Kota. The hypersensitive flecks failed to develop when exposure to darkness was interrupted by short (four-hour) daily periods of light, and also when the leaves were detached from the plants. Evidence was obtained of a correlation between the period of darkness required for the disturbance of compatibility between host and fungus of which flecking is the external symptom and the requisite duration of obscurity to kill the host tissues, the common factor in the causation of the two processes being probably of a metabolic order. On the return to the light of seedlings in which the tissues were not irreversibly affected by exposure to darkness, secondary pustules of a susceptible type appeared in the tissue adjacent to resistant primary infections resulting from darkening.

WATERHOUSE (W. L.). **On the production in Australia of two new physiologic forms of leaf rust of Wheat, Puccinia triticina Erikss.**—*Proc. Linn. Soc. New South Wales*, lvii, 1–2, pp. 92–94, 1932.

In November, 1930, dry wheat leaves heavily infected with the teleutospore stage of leaf rust (*Puccinia triticina*) were collected at Hawkesbury Agricultural College from a plot known to contain the physiologic forms Australian 1 and Australian 2 [*R.A.M.*, x, p. 367]. These leaves were kept in the laboratory throughout the summer and sent to Bathurst in the autumn to be exposed to winter temperatures. In September, 1931, abundant teleutospore germinations were observed. This is the first success in germinating these spores in a series of attempts covering a period of ten years, and is attributed to the protection afforded the teleutospores from the high summer field temperature, a method suggested by C. O. Johnston. Fragments of the wheat leaves bearing teleutosori were soaked in water for an hour and then placed on moistened young growths of *Thalictrum flavum* and *T. dipterocarpon.* After 24 hours both species showed abundant infections, from which eventually aecidiospores were taken to inoculate Federation wheat. Normal uredosori were produced and yielded uredospores which were tested on 12 differential wheat varieties. In addition to Australian 1 and Australian 2, two new physiologic forms (A and B) were distinguished by their effects on the Thew and Norka varieties.

SPANGENBERG (J.). **Observaciones sobre la modalidad e intensidad de ataque de la Puccinia glumarum en los cultivos Trigueros del país.** [Observations on the mode and intensity of infection by *Puccinia glumarum* in the Wheat stands of the country.]—*Min. Indus. Direcc. Agron. Publ. Mens.*, Montevideo, iv, 8, pp. 147–152, 1 col. pl., 2 figs., 1932.

A full account is given of the environmental conditions influencing the development and severity of the recently observed yellow rust (*Puccinia glumarum*) on wheat in Uruguay, with observations on the life-history of the parasite. A comparative table is given showing the distinguishing features of *P. glumarum* and the other wheat rusts occurring in Uruguay, viz., *P. graminis* and *P. triticina* [*R.A.M.*, xi, p. 359], and notes are given on the varietal reaction to the two last-named rusts of Uruguay wheats. *P. glumarum* was generally prevalent last season and none of the wheats grown appeared to be resistant to it.

MILAN (A.). **Le infezioni con 'Tilletia' ottenute per trauma e il grado di recettività dei tipi di Grano.** [Infections with *Tilletia* obtained by wounding, and the degree of susceptibility of Wheat types.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxix, 1, pp. 90–108, 2 graphs, 1932.

To ascertain whether infection following mechanical injury produces the same effect on wheat plants as results from sowing infected seed, the author carried out a series of experiments in continuation of his earlier researches [*R.A.M.*, viii, p. 228 ; x, p. 716], wheat seedlings of different varieties being wounded (by a needle prick at the base of the culms or by being broken off near the roots) and exposed to infection by *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*]. The results obtained [which are tabulated, expressed graphically, and discussed] may be summarized as follows.

In the first set (experiment A), inoculated through wounds on 10th December, 1929, Carlotta Strampelli wheat subsequently had 91·7 per cent. of the plants and 74 per cent. of the ears bunted, the corresponding figures for Gentile rosso mutico, Mentana, Fausto Sestini, and Dauno wheats being, respectively, 90 and 70, 50·3 and 31·8, 10 and 2·5, 11·9 and 2·7 per cent.; spelt wheat showed only 2·5 and 0·4 per cent. plants and ears infected, respectively, and rye remained unaffected.

When the seedlings were exposed to infection without previous wounding (experiment B) practically no infections resulted, the few that did occur being attributed to accidental wounding.

When the first experiment was repeated on 19th and 20th December (experiment C) and the seedlings were planted so closely that they were unable to tiller so that theoretically the number of bunted plants should equal the number of bunted ears, the Carlotta Strampelli wheat showed 57·2 per cent. of the plants and 56·3 per cent. of the ears affected, the corresponding figures for Gentile rosso mutico, Mentana, Fausto Sestini, and Dauno wheats being, respectively, 51·5 and 51, 26·3 and 26·1, 8·7 and 8·3, and 9·1 and 8·6 per cent. ; the spelt and rye remained unaffected.

In 1930–1 the tests were repeated on a larger scale, partly to ascertain the effect of carrying out the infections on different dates. Experiment A was repeated on 3rd and 4th December, with results that closely confirmed those obtained previously. On 22nd January experiment C was repeated, there being practically no tillering: the susceptible wheats showed less infection than in experiment C, while the resistant ones were about the same in both. This is attributed to the different dates and the different temperatures prevailing during growth renewal. A further test on 4th and 5th February, 1931, gave similar varietal results to those in December, though the percentages of affected ears were much lower, especially in the more susceptible varieties. When the experiment was repeated on 2nd April the susceptible varieties showed very slight infection (Carlotta Strampelli having only 8·7 per cent. bunted plants and 2·8 per cent. bunted ears), the moderately susceptible ones being those most affected, Mentana having 14·8 per cent. bunted plants and 9·5 per cent. bunted ears, and Ardito 12·9 and 5·6 per cent., respectively. In tests made on 12th and 23rd April with very robust seedlings, many of the plants died, the remainder maturing only a few ears; the only varieties to become infected were the early, moderately susceptible ones such as Mentana and Ardito.

In the author's opinion wound inoculations are, under certain conditions, the only reliable method of judging the relative reaction of varieties to infection by bunt. Whether wounding or sowing infected seed is resorted to, the only condition which gives truly comparable results is to prevent the plants from tillering, so that, theoretically, each plant corresponds to one ear. When, however, it is desired to estimate the damage from bunt that any given variety would probably sustain under field conditions, then this must be estimated from the number of affected ears.

MILAN (A.). **L'alterazione della forma sulle spiche di Grano colpite dalla carie.** [Alteration in the shape of bunted Wheat ears.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxviii, pp. 585–588, 1931. [Abs. in *Riv. Pat. Veg.*, xxii, 3–4, pp. 103–104, 1932.]

Wheat ears infected by *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*] when compared with healthy ones growing under identical conditions show a greater space between the points of insertion of the spikelets on the rachis, so that they appear to be longer and looser than normal. Furthermore, when wheats with clavate ears become infected they lose their characteristic apical expansion. These changes vary in degree with the severity of infection and may cause the ear of any given variety to appear to belong to a different variety.

RUSSELL (T. A.). **Observations on foot-rot diseases of cereals.**—*Trans. Brit. Mycol. Soc.*, xvi, 4, pp. 253–269, 1 pl., 1932.

The author states that a survey in 1929 and 1930 of cereal crops in the Cambridge district showed that seedling blights and ear blights due to fungal attack were comparatively rare; on the other hand, foot rot diseases as manifested by the symptoms of white-

heads and thinning-out were found to be present in almost every field examined, and sometimes attained serious proportions. Of the fungi isolated from affected plants *Fusarium culmorum* [*R.A.M.*, vii, p. 710; x, p. 784; xi, p. 444] proved to be by far the most common on all cereals. Two strains of *Helminthosporium sativum* were isolated from the base of stems of wheat, this being, so far as the author is aware, the first record of this species associated with root rot of wheat in England; a third strain was isolated from a barley seedling. Pathogenicity tests [details of which are given] showed *F. culmorum* and *H. sativum* to be highly pathogenic to wheat in the seedling stage, and later to produce the whitehead symptom. In the greenhouse *F. culmorum* attacked wheat, barley, and oats with equal severity, while *H. sativum* was more injurious to wheat than to barley and hardly affected oats [ibid., xi, p. 503]. Both fungi gained entry into wheat seedlings through the root and shoot tissues, their germ-tubes penetrating by boring through the cuticle.

The investigation suggested that this class of diseases may be controlled by a sound system of farming, including good tillage and balanced manuring.

VILKAITIS (V.). **Fusarium culmorum (W.G.Sm.) Sacc. žiemkenčiu grūduose.** [*Fusarium culmorum* (W.G.Sm.) Sacc. on winter-sown cereals.]—Reprinted from *Ž. Ū. Metraščio* [*Yearbook Acad. of Agric.*] *1930–31*, Kaunas [Kovno], 6 pp., 4 figs., 1932. [German summary.]

Investigation of the considerable damage that was done in 1931 to winter-sown wheat and rye in Lithuania by the so-called winter injury [*Fusarium* spp.] indicated that the trouble was in a very great measure attributable to the activity of *F. culmorum* [see preceding abstract]. This fungus was repeatedly isolated by the author from wheat and rye ears, and its pathogenicity to these hosts was definitely established in artificial infection experiments, which resulted in the typical reproduction of the disease.

DASTUR (J. F.). **Foot-rot and 'black point' diseases of Wheat in the Central Provinces.**—*Agric. & Live-Stock in India*, ii, 3, pp. 275–282, 3 pl., 1932.

Considerable damage is caused each year to the Nagpur (Central Provinces) wheat crop by foot rot and 'black point' (*Helminthosporium* spp.) [*R.A.M.*, vii, p. 493; x, p. 758]. The basal and underground portions of the plant show brown or creosote-coloured, later black, lesions; sometimes the rootlets are thin and fuzzy. Diseased plants are usually dwarfed and produce few or no heads. Some or all the glumes enclosing the grains bear elliptical, brown to black, dark-edged lesions; in advanced cases the grains may be light and shrivelled or partially blackened. Both seedlings and mature plants may be attacked, infection occurring either directly from the seed or through the soil. Seeds that are half or entirely blackened usually fail to germinate, though they may do so if the embryo is not penetrated by the mycelium. As a rule the blackening consists of a mere dot, sometimes barely visible, near the embryo. The infection of germinat-

ing seedlings, arising either from diseased or healthy seeds, is evident from the presence of lesions on the coleorhiza and the plumule. The pale to dark brown lesions on the plumule extend elliptically, sometimes reaching and killing the shoot. On the coleorhiza the spots spread irregularly and may destroy the primary and lateral roots, while the rhizome may also be infected from this source, or from the soil. The adventitious roots arising from the succeeding nodes of the plumule are generally liable to infection from the diseased coleoptile and remnants of the lower leaf sheaths. The foot-rotting fungi have been known to remain viable in 'black point' seed and diseased parts of wheat plants for at least three years.

The results [which are tabulated] of field experiments on the development of foot rot and black point in relation to the date of sowing indicate that late sowing (middle to end of October and early November) reduces the incidence in infection. High atmospheric humidity when the grain is in ear has been observed to favour the development of black point, to which the Bansi and Pusa 100 varieties are particularly susceptible, the former being specially liable to attack by *H. sativum*.

KLING. **Starkes Auftreten von Staubbrand in der Wintergerste.** [An extensive outbreak of loose smut in winter Barley.]—*Deutsche Landw. Presse*, lix, 25, p. 316, 1932.

Winter barley in the Cassel district of Germany has been attacked to an unprecedented extent by loose smut [*Ustilago nuda*: *R.A.M.*, x, p. 782], the incidence of infection by which ranged from 30 to 90 per cent., and a heavy reduction of the total yield was anticipated at the time of writing. Over an area of about 1 sq. m. 180 out of 400 plants were smutted, and it was found that such fields had been sown with seed-grain several years old. Stands from original and first year's seed, on the other hand, were virtually free from loose smut. Since the hot-water treatment is beyond the capacity of the average farmer, the control of loose smut can only be effected by the use of fresh seed from certified healthy stands.

SCHNEIDER. **Nochmals: Staubbrand in der Wintergerste.** [A further note on loose smut in winter Barley.]—*Deutsche Landw. Presse*, lix, 27, p. 341, 1932.

Loose smut [*Ustilago nuda*] of winter barley has been very severe during the current season in the Höchst district, Frankfurt-am-Main, especially on the Streng variety [see preceding abstract]. Original stands were equally affected with those from seed-grain several years old.

TAPKE (V. F.). **Seed treatments with chemical dusts and formaldehyde for smut control in Oats.**—*Phytopath.*, xxii, 5, pp. 429–441, 1932.

Full details are given of a series of disinfection experiments against the loose and covered smuts of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]) conducted in Virginia and Idaho in 1928 and 1930 and in the former State in 1931. Twenty-one chemical dusts

were used at the rate of about 3 oz. per bushel in comparison with the formaldehyde dip (ten minutes at a strength of 1 in 320).

The latter gave the best results in 1930 and 1931, completely eliminating infection (which was relatively high in the untreated controls in every seed lot). In both years the Du Bay dusts 655 and 665 (the active ingredient of which is ethyl mercury phosphate) [cf. *R.A.M.*, xi, pp. 454, 491] gave almost absolute control. Smuttox [ibid., x, p. 449], kantsmut, and corona oat dust [ibid., vi, p. 399], containing 4, 4, and 5 per cent. formaldehyde, respectively, came next in efficacy, reducing the incidence of infection to 1 per cent. or less (mostly nil) in all the seed lots. Ceresan was also highly toxic to the smuts in every test except one, when 2·8 per cent. infection occurred in the seed lot treated with this preparation compared with 24·2 per cent. in the control. K–1–C, tested in 1928, gave fairly satisfactory results while K–1–D was not so effective; both these dusts are similar in composition to ceresan but contain less of the toxic principle (ethyl mercury chloride). Ansbacher grain dust and wa-wa dust [ibid., vii, pp. 363, 572] gave good results in Virginia and in the second but not in the first Idaho sowing in 1930. No appreciable reduction of germination was caused by any of the treatments except the formaldehyde dip, which produced a decline in 1931 from 93·3 to 88·8 per cent.

WESTON (W. H.) & UPPAL (B. N.). **The basis for Sclerospora sorghi as a species.**—*Phytopath.*, xxii, 6, pp. 573–586, 1 pl., 1 fig., 1932.

Comparative investigations have been carried out on Kulkarni's *Sclerospora graminicola* var. *andropogonis* on sorghum from Poona, India, on *S. graminicola* from *Pennisetum typhoideum* collected in the same locality, and on *Setaria* in the United States [*R.A.M.*, x, p. 517]. In the former the conidiophores bear a branch system of usually three primary branches of approximately equal size, spreading out from the main axis in close succession so that the conidia borne on the tips of the branchlets lie in a hemispherical plane, whereas in the type species short branches grow out at irregular intervals and the conidia lie in irregularly disposed bunches. The sterigmata tend to be somewhat longer in the sorghum fungus, a further distinguishing feature of which is the presence of a transverse septum about half-way between the conidiophore base and the beginning of the branch system. In the sorghum *Sclerospora* the conidia are generally broadly rotund and the ends equally bluntly rounded, with the greatest diameter at the middle, while in *S. graminicola* a point somewhat above the middle shows the greatest breadth, the apex being bluntly rounded and the base somewhat tapering. The most important difference between the two fungi, however, is that, while in the fungus on sorghum the conidial wall continues unaltered across the apex, in *S. graminicola* it is thickened at maturity into an apical papilla. Moreover, the conidia of *S. graminicola* germinate by zoospores, whereas in the sorghum fungus germination is by one or two germ-tubes. The oospore stages are very similar in both organisms.

A further difference between the two fungi was shown by cross-

inoculation experiments [the results of which are tabulated] with oospore material germinated by Hiura's method [ibid., ix, p. 774]. The sorghum fungus failed to infect *Setaria italica* and *P. typhoideum*, while *S. graminicola* from these hosts cannot attack sorghum. Both the sorghum fungus and *S. graminicola* from *Setaria* gave positive results on teosinte (*Euchlaena mexicana*). On the basis of these morphological and physiological distinctions the sorghum fungus is raised from varietal to specific rank as *S. sorghi* (Kulk.) Weston & Uppal with an emended diagnosis in English.

UPPAL (B. N.) & DESAI (M. K.). **Two new hosts of the downy mildew of Sorghum in Bombay.**—*Phytopath.*, xxii, 6, pp. 587–594, 1 fig., 1932.

In 1929 maize plants of local, Philippine, and Golden Bantam varieties at Poona were severely attacked by a downy mildew, the symptoms of which closely resembled those caused on sorghum by *Sclerospora graminicola* var. *andropogonis-sorghi* [*S. sorghi*: see preceding abstract], except that the former host did not show the characteristic shredding of the leaves. Inoculation experiments under controlled conditions with the sorghum *Sclerospora* gave positive results on maize and teosinte (*Euchlaena mexicana*). A comparative morphological study [details of which are given] of the conidial phase of the mildew as it occurs naturally on maize and sorghum revealed no significant or constant differences between the organisms on the two hosts, and it is therefore concluded that *S. sorghi* is responsible for the disease in both cases.

MAKLAKOVA (GALINA F.). Некоторые данные о развитии черни на Мандариновых насаждениях в Батумском округе. [A few data concerning the development of sooty moulds on Tangerine trees in the district of Batum.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 97–110, 1 pl., 1932. [English summary.]

In noticing the wide distribution and severity of sooty mould on various plants and trees on the Caucasian littoral of the Black Sea, the author gives a detailed account of her experiments to determine the factors that favour its spread and development on tangerine [*Citrus nobilis* var. *deliciosa*] trees, which are particularly severely affected by it in that region. The results indicated that scale insects, especially *Lecanium hesperidum*, play an important part in the development and spread of the moulds; the latter grow most profusely around and on the fixed insects which are finally destroyed by one or more of the fungi, an undetermined species of *Cladosporium* being particularly active in this respect. There was some evidence that a species of *Ceroplastes* may also be involved. The main spread of the moulds is, however, ensured by rain and wind. The fungi developed as well in diffused as in direct light, and the main factor determining a luxuriant growth of the organisms was found to be moisture.

Microscopical determinations showed that among the fungi responsible for sooty mould the undetermined species of *Cladosporium* was numerically the most important, the other organisms

most frequently encountered being *Capnodium citri* [*R.A.M.*, x, p. 492], and species of *Macrosporium*, *Alternaria*, and *Helminthosporium*.

A series of tests showed that the germination of the *Cladosporium* was totally inhibited by a 0·1 per cent. copper sulphate solution, even in the presence of 5 per cent. sugar; the addition of 15 to 20 per cent. sugar to the copper sulphate solution appeared, however, to preserve a few of the spores from destruction, their germination being only delayed.

Cooke (F. C.). **Investigations on Coconuts and Coconut products.**—*Dept. of Agric. Straits Settlements and Fed. Malay States Bull.* 8, Gen. Ser., 99 pp., 9 pl., 3 figs., 1932.

The following items of phytopathological interest occur in the section of this bulletin dealing with various aspects of copra deterioration (pp. 67–71). The moulds chiefly responsible for damage to stored copra in Malaya are *Aspergillus niger*, *A. flavus-oryzae*, and *A. tamarii*, penetrating wet material, and *A. glaucus* and *A. cinnamonensis*, occurring superficially on dry copra [cf. *R.A.M.*, xi, p. 175]. The presence of excess moisture (over 8 per cent.) is evidently the determining factor in the initiation of copra deterioration, but it is not the sole one, since the moulds do not generally appear until after the development of a bacterial slime, a process occupying about two days from the time the nuts are split and exposed to the air. Possibly the sequence of invasion by bacteria and moulds is determined by the appearance of certain degradation products of the complex glycerides, proteins, and carbohydrates present in coco-nut 'meat'.

Ultée (A. J.). **Verslag over de werkzaamheden van het Proefstation Malang in het jaar 1931.** [Report on the work of the Malang Experiment Station in the year 1931.]—*Meded. Proefstat. Malang*, 82, 55 pp., 1932.

The following item of phytopathological interest occurs on p. 15 of this report. The fact that coffee plants (both Robusta and Excelsa) raised from the seed of trees suffering severely from top die-back remained healthy has confirmed the supposition that the disease does not spread in this manner [*R.A.M.*, x, p. 518].

Mayne (W. W.). **Recent work on Coffee leaf disease.**—*Planters' Chron.*, xxvii, 10, pp. 253–257, 1932.

The coffee selection (S. 5/30) that first revealed the existence of two physiologic forms of leaf disease (*Hemileia vastatrix*) in South India [*R.A.M.*, xi, p. 511] is stated to belong to a collection grown from seed which came from the Wager estate in North Mysore under the title of 'Parent of Kent' [a name which Mr. L. P. Kent subsequently, on p. 400 of the same journal, states to be an error]. Tests made on one or two of the Kent plants showed that their reaction to the forms of leaf disease is identical with that of S. 5/30, and assuming that a considerable proportion of the plants of this variety possess the character of resistance, their success as fillers for the susceptible Coorg variety is readily explicable. As the form on the Kent variety, however, develops and sporulates as rapidly as that infecting the Coorgs, there is no reason why it

should not attack the former variety when grown in large blocks with equal severity, and such a phenomenon has, indeed, actually been observed in clearings of Kents in districts where *H. vastatrix* is prevalent. The importance of these observations to the general problem of the improvement of South Indian coffee strains is briefly indicated. In describing the technique of his experiments the author states that the main factor necessary for successful infection is the exclusion of light during the period immediately after inoculation.

STAHEL (G.). **Zur Kenntnis der Siebröhrenkrankheit (Phloëmnekrose) des Kaffeebaumes in Surinam. II.** [Contribution to the knowledge of the sieve-tube disease (phloem necrosis) of the Coffee tree in Surinam. II.]—*Phytopath. Zeitschr.*, iv, 5, pp. 539–544, 4 figs., 1 map, 1932.

Continuing his investigations on phloem necrosis of Liberian coffee in Surinam [*R.A.M.*, xi, p. 236], the writer examined, in December, 1931, the roots (preserved in alcohol) of three bushes showing similar symptoms in the West Bank district of British Guiana. Phloem necrosis in a very acute form was detected in all three cases, indicating that the sudden collapse of apparently healthy bushes in the latter country is due to the same cause as the chronic disease of coffee in Surinam. At the same time a report was received from Brazil of the so-called 'red' disease of Arabica coffee, the external symptoms of which correspond closely with those of phloem necrosis (S. Hardman, Relatorio do anno de 1927. Sec. Agric., Comm., Indus., etc., 1928).

According to this report a disease of coffee bushes was first observed in 1917 in Pernambuco and Parahyba, but it was not until 1921 that extensive wilting and dying-off began to take place. Prof. B. Pickel, of the Tapera Agricultural College, found that a coccid, *Rhizoecus coffeae,* living in symbiosis with an ant, *Acropyga pickeli*, is constantly present in large numbers on the roots of diseased trees and appears to be concerned in the transmission of infection. The sporadic occurrence of the latter in healthy, vigorous plantings is attributed to the fact that the winged ants each carry a coccid with them on their flights. The same observation was made independently by H. Bünzli. Hardman and Pickel found that older trees are more liable to the 'red' disease than young ones. At the writer's request fragments of the cortex of diseased coffee roots were sent to him from Brazil, and were found on examination to show the multiple division and necrosis of the sieve-tubes characteristic of phloem necrosis in Surinam, though in Arabica coffee these features are less conspicuous than in the Liberian. On staining this material with Giemsa's fluid fusiform structures of the *Phytomonas* type were detected, but since the presence of flagella (though indicated) could not be clearly established the exact identity of these bodies remains uncertain pending further studies. The coccids were observed to have pushed their stylets through the cortex to the phloem. As soon as a diseased root is entirely depleted of starch, a new healthy one is sought, and it is highly probable that flagellates are thus transferred to the phloem of sound roots.

HOPKINS (J. C. F.). **Some diseases of Cotton in Southern Rhodesia.**—*Empire Cotton Growing Review*, ix, 2, pp. 109–118, 1932.

The results of five years' field observations and laboratory experiments on cotton diseases in Southern Rhodesia are summarized. Seed disinfection against *Bacterium malvacearum*, which occurs in the angular leaf spot form, is recommended and may require to be supplemented by more attention to rotation as the six to seven months of dry weather in Rhodesia gives little chance for the rapid disintegration of infected leaves and bolls [cf. *R.A.M.*, x, p. 661].

Internal boll disease has so far only been found associated with *Nematospora coryli* [ibid., x, p. 519], which appears from field observations to be conveyed in Southern Rhodesia, as in other regions, by *Dysdercus* spp. These insects appear in the cotton fields about the end of February or beginning of March, i.e., at the beginning of the dry season when conditions are relatively unfavourable for the fungus. Boll rots of minor importance are caused by *Rhizopus nigricans* [ibid., x, p. 586]; *Epicoccum purpurascens*, a virulent wound parasite, producing a bright yellow, later yellowish-brown discoloration of the internal tissues of the boll wall; and an apparently new bacterium closely resembling *Bact. mori* [ibid., x, p. 347], which is responsible for a soft, brown internal rot of the lint and seed and a brown discoloration of the placenta, to which it gains entrance through the sutures. The strain of *E. purpurascens* appears to be identical, according to an unpublished communication, with that isolated by Miss Bottomley from citrus in South Africa.

Notes are also given on the leaf spot and boll rot due to *Alternaria gossypina* [ibid., xi, p. 371], the leaf spots due to *A. macrospora* [ibid., x, p. 586] and *Phyllosticta gossypina* [ibid., x, p. 435]; sore shin (*Rhizoctonia* [*Corticium*] *solani*) [ibid., xi, p. 454]; discolorations of the lint caused by members of the *A. tenuis* group, a species of *Acremoniella* apparently identical with one observed by the writer in Uganda, and other fungi; a stem disease associated with *Pestalozzina* sp., believed to be the first record of this genus on cotton; and anthracnose (*Glomerella gossypii*) [ibid., iv, p. 217].

YOUNG (W. H.), JANSSEN (G.), & WARE (J. O.). **Cotton wilt studies. IV. Effect of fertilizers on Cotton wilt.**—*Arkansas Agric. Exper. Stat. Bull.* 272, 26 pp., 4 figs., 1 map, 1932.

High potash applications (muriate of potash 300 lb. or kainit 1,080 lb. per acre) or fairly high potash applications in combination with nitrogenous and phosphoric salts (nitrate of soda 150 lb., superphosphate 312 lb., and muriate of potash 40 lb. per acre) gave good control of cotton wilt [*Fusarium vasinfectum*] on the susceptible Trice and Misdel varieties in Arkansas in experiments from 1929 to 1931 [*R.A.M.*, xi, p. 453]. High nitrate applications, nitrogen and phosphorus only, and cottonseed meal alone were ineffective for this purpose. In nearly every case the control of wilt seemed to be correlated with that of 'rust' or potash hunger, and

coupled with increased yields. It is probable, therefore, that on the sandy alluvial soils where 'rust' and wilt are often found together in a severe form, the combination of a suitable wilt-resistant variety with the judicious use of a potash-containing fertilizer will be the best to use.

DANA (B. F.), REA (H. E.), & DUNLAVY (H.). **The influence of date of planting Cotton on the development of root-rot.**—*Journ. Amer. Soc. Agric.*, xxiv, 5, pp. 367–377, 3 diags., 1932.

An extensive range of cotton plantings was made at Temple, Texas, from 1928 to 1930, inclusive, to determine the influence of the date of planting on the incidence of root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xi, p. 573] in Houston black and clay soils, which are very favourable to the disease. In 1928 the plantings were made on 1st and 15th April, 1st and 15th May, and 1st and 15th June; in 1929 on 22nd April and 4th and 20th May; and in 1930 on 10th April and 1st and 29th May. Several out-of-season plantings were also made, viz., on 15th March and 1st and 15th June in 1928 and on 13th June in 1929. The Delfos, Kasch, and Bennett varieties (early, medium, and late, respectively), were used for each date in each year. In 1928 and 1929 Westex (early), Acala (medium), Sunshine (medium), and Mebane (late) were also used.

The first appearance of the disease was found to be influenced by the age of the crop. In no instance did less than 30 days elapse between the planting and the first sign of infection. For the planting of 15th June, 1928, the initial infections were later on the average than in that of 1st June, while at the latter date the appearance of the disease was delayed as compared with 15th May. In 1929 infection occurred later on the planting of 20th May than on that of 4th May, and still later on that made on 13th June. Again, the plantings made on 1st and 20th May, 1930, showed a greater delay in the appearance of the disease than those of 10th April. The absence of any relation between the age of the plants and the amount of root rot infection in the earlier sowings suggests that some other factor, probably temperature, is of primary importance at this time. After root rot was established, however, and temperatures had become favourable to infection, the age of the plant exerted a decisive influence. In Delfos, for instance, the infection counts on 11th August, 1928, showed losses of 16·1, 23·5, 17·6, 11·0, 8·0, 3·6, and 1·4 per cent., respectively, in early to late plantings from 15th March to 15th June. In 1929 (counted on 12th August) the percentages were 21·3, 17·0, 7·1, and 6·4 from 22nd April to 13th June, and again in 1930 (11th August), the plantings made from 10th April to 20th May showed a rapid decline in loss percentages in the order of 23·8, 13·6, and 7·0, respectively.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Resistance of monocotyledons to Phymatotrichum root rot.**—*Phytopath.*, xxii, 5, pp. 443–452, 1 fig., 1932.

Laboratory and field inoculation experiments [details of which

are given] in Texas on a large number of monocotyledonous plants with the causal organism of cotton root rot (*Phymatotrichum omnivorum*) [see preceding abstract] gave entirely negative results, whereas control inoculations on cotton, carrot, and okra [*Hibiscus esculentus*] caused the development of typical symptoms in every case. Evidently, therefore, the monocotyledons tested are neither hosts nor carriers of the fungus.

BACH (W. T.) & TAUBENHAUS (J. J.). **Resistance of the Turk's-Cap Hibiscus, Malvaviscus conzattii, to Phymatotrichum root rot.**—*Phytopath.*, xxii, 5, pp. 453–458, 1 fig., 1932.

The Turk's-cap *Hibiscus* (*Malvaviscus conzattii*) appears to constitute an exception to the rule that plants belonging to the Malvaceae are highly susceptible to cotton root rot (*Phymatotrichum omnivorum*) [see preceding abstract]. Among 82 species of this family, *M. conzattii* was the only one showing no infection under field conditions in Texas, while 1,066 inoculation tests on well-established plants also gave negative results.

EZEKIEL (W. N.), TAUBENHAUS (J. J.), & FUDGE (J. F.). **Growth of Phymatotrichum omnivorum in plant juices as correlated with resistance of plants to root rot.**—*Phytopath.*, xxii, 5, pp. 459–474, 1932.

Phymatotrichum omnivorum, the causal organism of cotton root rot [see preceding abstracts], was grown in the juices expressed from four monocotyledonous plants, viz., maize, onion, *Canna*, and nut grass (*Cyperus rotundus*), resistant to the disease and from four dicotyledonous plants (cotton, carrot, turnip, and sweet potato) susceptible to it. The oven-dry weight of the resulting mycelium was determined.

The growth of the fungus was markedly inhibited in the undiluted but autoclaved juices of all the resistant plants, whereas profuse development occurred in the juices of all the susceptible ones except turnip.

PETCH (T.). **Notes on entomogenous fungi.**—*Trans. Brit. Mycol. Soc.*, xvi, 4, pp. 209–245, 8 figs., 1932.

Continuing his notes on entomogenous fungi [*R.A.M.*, xi, p. 179], the author describes and discusses 27 species of *Cordyceps* and other genera, mostly from tropical and sub-tropical regions. Referring to his previous note on *Empusa lecanii* [ibid., vi, p. 228], he states that he received from Ocfemia specimens of *Aphis sacchari* from the Philippine Islands in a condition similar to that described by him on *Lecanium viride*; the dead insects are covered with *Cladosporium*, among which are fine hyphae bearing vesicles resembling the sporangia of a *Pythium* as figured in the previous communication [loc. cit.]; a comparison with the figures of Thaxter (*Entomophthoreae of the United States*) shows clearly that the supposed sporangia are secondary conidia of a species of *Empusa* which, from the details available, should apparently be referred to *E. fresenii* [ibid., x, p. 226]. According to Ocfemia the disease killed from 80 to 95 per cent. of the aphids in some experiments.

Specimens received from Florida showed that the fungus on

Aleyrodes citri and other citrus scale insects which was referred by Fawcett to *Verticillium heterocladum* [ibid., vi, p. 255] differs from Penzig's species in having solitary terminal conidia on the phialides and no warts or sterigmata, and also in having some of the whorls of phialides on short lateral branches; it is therefore considered to be a separate species, for which the name *V. cinnamomeum* nom. nov. is proposed, an English diagnosis being given.

A number of the species described are considered to be new to science.

WATERS (R.). **Mycotic dermatitis in sheep.**—*New Zealand Journ. of Sci. and Techn.*, xiii, 5, pp. 309–310, 1 fig., 1932.

Attention is drawn to the occurrence in merino sheep in South Island, New Zealand, of mycotic dermatitis due to *Actinomyces dermatonomus*, which has previously been reported from Australia and South Africa [*R.A.M.*, xi, p. 457].

BARDELLI (P.) & CILLI (V.). **Osteomielite tibiale primitiva di origine centrale da 'Cryptococcus farcinimosus Rivoltae'.** [Primary tibial osteomyelitis of central origin due to *Cryptococcus farcinimosus* Rivolta.]—*Clinica Veter.*, 1, 1931. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, p. 385, 1932.]

Two cases of tibial osteomyelitis in equines (a rare condition), due to *Cryptococcus farcinimosus* [? in Italy: *R.A.M.*, x, p. 791], are described, showing the possibility of haematogenous diffusion of the organism.

SCARAMELLA (PIERA). **Su un infezione fungina di nova conservate in frigorifero prodotta dal 'Verticillium monosporioides' Peyr.** [On a fungal infection of eggs in cold storage produced by *Verticillium monosporioides* Peyr.]—Reprinted from *Giorn. Biol. Appl. alla Indus. Chim.*, i, 4, 12 pp., 1 fig., 1931.

A large proportion of a consignment of eggs kept in cold storage in Italy in 1930 developed a serious fungal infection apparently induced by the humid conditions which caused drops of water to condense on the shells. The albumen of badly affected eggs contained clots consisting of the hyphae of *Verticillium monosporioides* Peyronel. The fungus was found to be capable of growing and fructifying at a temperature of 0·5° to −0·5° C.; in hanging drop cultures the spores germinated in 24 hours at 20°. The disease was reproduced artificially in an atmosphere maintained at 0° C. and 98° humidity, the spores germinating and penetrating the eggs in four days.

GRAHAM (G. S.). **Rhinosporidium seeberi in nasal polyp. The fourth North American case.**—*Amer. Journ. Clin. Path.*, ii, 2, pp. 73–85, 8 figs., 1932.

Full clinical details are given of a case of nasal polypus due to *Rhinosporidium seeberi* [*R.A.M.*, xi, p. 515] in a negro boy in Alabama. The source of infection is unknown, no similar condition having been observed in the community for at least ten

years. In fact, the discontinuity of infection is a remarkable feature of rhinosporidiosis, of which over forty cases reported during the last thirty years have been observed in three widely separated countries, namely, India, Argentina, and the United States.

SARTORY (A.), SARTORY (R.), WEILL (J.), & MEYER (J.). **Un cas de blastomycose invétérée transmissible au cobaye, due à un Saccharomyces pathogène (Saccharomyces jadini n. sp.).** [A case of deep-seated blastomycosis transmissible to the guinea-pig, due to a pathogenic *Saccharomyces* (*Saccharomyces jadini* n. sp.).]—*Comptes rendus Acad. des Sciences*, cxciv, 19, pp. 1688–1700, 1932.

From an abscess in the sacral region of a young woman the writers isolated in 1931 a species of *Saccharomyces* characterized by budding oval cells, 4 to 5 by 2 to 3 μ in diameter, and numerous asci measuring 5 by 3·75 μ, which contained two or four ascospores each 1·25 μ in diameter. On solid media hyphal elements up to 25 to 30 by 1·25 to 2·5 μ were formed. The fungus, to which the name *S. jadini* n. sp. is given, coagulates milk but does not liquefy gelatine or utilize albumin; glucose and maltose are actively fermented. It was inoculated into guinea-pigs with fatal results after five to seven months and reisolated from the liver and spleen.

REDAELLI (P.). **Il problema delle Torulopsidaceae e dei loro rapporti con l'uomo e con la patologia umana studiato particolarmente in Italia (Blastomiceti e blastomicosi).** [The problem of the Torulopsidaceae and their relations to man and to human pathology studied particularly in Italy (Blastomycetes and blastomycoses).]—Reprinted from *Riv. di Biol.*, xiii, 67 pp., 3 figs., 1931.

In this paper, which describes in detail a long series of investigations into the Torulopsidaceae (Blastomycetes) with reference to their relation with human pathology under the climatic conditions prevailing in temperate climates, and especially in Italy, the author, after fully discussing the systematic position of these fungi [*R.A.M.*, viii, p. 677], deals with their life in the atmosphere surrounding man (infection generally arising from contact, food, and drink), their possible relations with the various parts of the body ('commensalism'), their mode of infection and spread in the different organs, their ability to act as parasites, the natural susceptibility to them possessed by man, and the forms of disease they set up considered from an anatomical and clinical point of view. The genera known to contain human parasites are *Torulopsis* and *Pityrosporum* (corresponding to the old genus *Cryptococcus*), *Blastodendrion*, *Geotrichum*, *Candida*, *Mycotorula*, and *Enantiothamnus*. The paper concludes with a consideration of some diagnostic problems of blastomycoses in general and questions of experimental pathology.

A list is given of works containing important bibliographies of the subject.

NIÑO (F. L.). **Consideraciones diagnosticas acerca de la propagación al aparato respiratorio de la blastomicosis de Gilchrist.** [Diagnostic considerations on the propagation in the respiratory system of Gilchrist's blastomycosis.]—*6ª Reunion Soc. Argentina Patol. Region. Norte, Salta, 1930*, pp. 168–179, 1931. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, pp. 388–399, 1932.]

Clinical observations are made on a fatal case of blastomycosis of the Gilchrist-Stokes type [*Blastomyces dermatitidis*: *R.A.M.*, vii, p. 578; ix, p. 652; xi, p. 43]. Rounded, yeast-like elements with a thick membrane were detected in the pus of the buccal lesions and sputum as well as in sections from scrapings. Cultures were extremely difficult to obtain and always scanty; the best media were glucose agar and coagulated human serum. The brownish colonies were formed of rounded elements of varying dimensions, the largest surrounded by a thick membrane and filled with spherical bodies; more or less elongated hyphae, with intercalary and terminal swellings, also occurred. At the autopsy the lungs were found to be choked with miliary granulations enclosing giant cells teeming with the organism. Diffusion by way of the lung is stated to occur in 97 per cent. of the cases of Gilchrist's blastomycosis.

BASGAL (W.). **Contribuição ao estudo das blastomycoses pulmonares.** [Contribution to the study of the pulmonary blastomycoses.]—*Thesis, Fac. Med. Rio de Janeiro*, 156 pp., 15 pl., 1931. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, p. 382, 1932.]

After a general exposition of the pulmonary mycoses and their various agents, the writer gives a minutely detailed account, supplemented by radiographs, of five cases in which generalized buccal ulcerations due to *Coccidioides* were accompanied by pulmonary disorders; the presence of the fungus was demonstrated in the sputum of two patients. Da Fonseca's and Leão's determination of the Brazilian *Coccidioides* as distinct from the North American species [*C. immitis*: *R.A.M.*, vii, pp. 167, 719; ix, p. 652] is accepted.

STEWART (R. A.) & MEYER (K. F.). **Isolation of Coccidioides immitis (Stiles) from the soil.**—*Proc. Soc. Exper. Biol. and Med.*, xxix, 8, pp. 937–938, 1932.

Epidemiological studies on coccidioidal granuloma (*Coccidioides immitis*) [*R.A.M.*, xi, p. 515, and preceding abstract], recently summarized by Beck (*California Dept. of Public Health Special Bull.* 57, p. 19, 1931), suggest the soil and vegetation as the probable source of infection. In the course of detailed studies at the University of California it was found that the following medium gave selective cultures: 1 part each of ammonium chloride and sodium acetate, equal mixture of KH_2PO_4 and K_2HPO_4 0·4 part, magnesium sulphate 0·01 part, and distilled water 100 parts. *C. immitis* and certain species of *Blastomyces* and *Aspergillus* are stated to make extremely good growth in this solution, to which acriflavine (1 in 25,000) may be added for further purification from contaminants.

To obtain the fungus from large samples of soil or vegetation, such as the earth round the sleeping quarters at a ranch in Kern County, the sample of dirt is mixed with a small amount of brine and triturated into a thick paste which is percolated into a cylinder containing 30 per cent. salt solution. As the particulate matter passes through the column of brine the bacterial and fungus spores are liberated and rise to the surface. After three hours' exposure of the soil to the action of the brine the supernatant liquid is decanted, diluted one-half with sterile water, and centrifuged, the sediment being either cultured in the selective medium or inoculated subcutaneously into guinea-pigs.

Positive isolations from the soil of the ranch in question were anticipated on account of four cases of coccidioidal granuloma among the Filipino working crew and were obtained. The inoculated guinea-pigs developed either a generalized infection with miliary localization in the lungs, purulent epididymitis and lymphadenitis, or merely temporary abscesses at the site of injection. The pus contained the characteristic double-contoured capsules with endospores. Obviously the mould is highly virulent on isolation from the soil, where it is capable of surviving for months.

NIÑO (F. L.). **Blastomicosis humana generalizada por criptococo (n. sp.).** [Generalized human blastomycosis due to a new species of *Cryptococcus.*]—*6ª Reunion Soc. Argentina Patol. Region. Norte, Salta, 1930*, pp. 117–167, 3 pl., 1931. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, p. 386, 1932.]

In this memoir and a preceding one of the same title by D. Speroni, L. Llambias, S. Parodi, and the author (5ª Reunion, 1929), a comprehensive account is given of a fatal case of generalized blastomycosis involving the skin, internal organs, and the brain (encephalitic meningitis). The fungus isolated from the affected organs and from the cephalo-rachidian liquid is described as a non-thermophilic yeast with colonies composed entirely of blastospores, and is named *Cryptococcus psicrofilicus* Niño.

MAZZA (S.), DE NUCCI (L. S.), & FEIJOO (E. J. C.). **Blastomicosis cutanea de forma lenta por criptococco (n. sp.).** [A slow form of cutaneous blastomycosis due to a new species of *Cryptococcus.*]—*5ª Reunion Soc. Argentina Patol. Region. Norte, Jujuy, 1929*, pp. 293–308, 21 figs., 1930. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, p. 395, 1932.]

A non-thermophilic, pink yeast, *Cryptococcus mitis* n. sp., was isolated from chronic ulcers on a ten-year-old native Argentine child. Only the thick-walled budding forms develop in cultures, without hyphae or asci. The lesions are reported to have originated seven years earlier.

MAZZA (S.), NIÑO (F. L.), & EGUËS (A.). **Perionixis blastomicetica por Monilia (n. sp.).** [Blastomycotic perionychia due to *Monilia* (n. sp.).]—*5ª Reunion Soc. Argentina Patol. Region. Norte, Jujuy, 1929*, pp. 284–288, 1 pl., 1930. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, p. 391, 1932.]

A new species of *Monilia*, *M. inexpectata* [see next abstract],

forming hyphae and blastospores but no asci in culture, was isolated from the nails of a woman at Buenos Aires.

NIÑO (F. L.), FERNANDEZ (J.), & PALANT (M.). **Nuevas observaciones de onixis y perionyxis de origen blastomicosico.** [New observations on onychia and perionychia of blastomycotic origin.]—*6ª Reunion Soc. Argentina Patol. Region Norte, Salta, 1930,* pp. 35–99, 1931. [Abs. in *Bull. Inst. Pasteur,* xxx, 8, p. 391, 1932.]

Observations are made on three new cases of blastomycotic onychia and perionychia, with numerous figures of the lesions obtained in laboratory experiments on animals. One case was attributed to *M. inexpectata* [see preceding abstract], and the two others to *M.* [*Candida*] *krusei* [*R.A.M.*, xi, p. 373].

OLIVER (H. G.). **Bronchomoniliasis in Jersey.**—*Brit. Med. Journ., 1932,* 3722, p. 863, 1932.

During the past ten years the writer has examined the sputa of all his patients, both juvenile and adult, showing bronchitic or associated symptoms (chronic cough, dyspnoea, and the like), and in the great majority of cases the presence of *Monilia* [*Candida*] has been detected [*R.A.M.*, vii, p. 578]. The conditions in question are usually relieved by systematic treatment with vaccine and liberal doses of potassium iodide. Since the discovery of the fungus in cow's milk, the boiling or pasteurization of all milk before consumption is recommended. An increase in the number of cases of bronchomoniliasis has been observed during the summer, a fact that may bear directly on the etiology of 'June epidemic pneumonia'. In adults *Monilia* is frequently found together with the tubercle bacillus in the sputa of cases of pulmonary tuberculosis, the inference being that moniliasis is the primary infection.

DA FONSECA (O.) & LEÃO (A. E. de A.). **Las cromoblastomicosis.** [The chromoblastomycoses.]—*5ª Reunion Soc. Argentina Patol. Region Norte, Jujuy, 1929,* pp. 329–350, 1930. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, pp. 397–398, 1932.]

This is a comprehensive and thoroughly documented survey of the chromoblastomycoses or verrucose dermatites. The only case due to *Phialophora verrucosa* was reported from the United States, whereas the Brazilian form caused by *Acrotheca pedrosoi* is much more common, being the subject of 14 published communications apart from simple records. Analogous lesions are stated to have been observed in Russia, Cuba, Sumatra, and the Argentine, but mycological studies have yet to be made. The authors do not agree with Langeron's classification of *A. pedrosoi* as a member of the genus *Trichosporum* [*R.A.M.*, viii, p. 646].

EMMONS (C. W.). **Pleomorphism and variation in the dermatophytes.**—*Arch. of Dermatol.*, xxv, 6, pp. 987–1001, 5 pl. (1 col.), 1932.

Six variants [detailed descriptions of which are given] arose from a single culture of *Achorion gypseum* [*R.A.M.*, x, p. 730] on horn, each type of growth preserving its distinctive characters in culture.

Full particulars are also given of variants developing from three strains of *Trichophyton gypseum* [ibid., xi, p. 458]. A striking feature of the *A. gypseum* cultures was that pleomorphism occurred readily in the parent strain, while the variants did not appear to be subject to this change, unless they reverted by sectoring to the original type [cf. ibid., xi, p. 373].

NAKAMURA (T.). **Über die Nageltrichophytie und eine neu entdeckte Pilzvarietät.** [On trichophytosis of the nails and a newly discovered fungus variety.]—*Japanese Journ. of Dermatology*, xxxii, 6, pp. 515–527, 10 figs., 1932. [German summary on pp. 65–66.]

A fungus characterized by branched, septate hyphae, aleuria, terminal or intercalary chlamydospores, gemmae, nodular organs, racket-shaped elements, and stalked, pocket-like appendages with yellow granules was isolated from the severely deformed nails of a girl in Tokyo. On Sabouraud's agar the colonies turned from yellowish-brown to brown with a greenish-yellow edge and eventually to purple; radial furrows and convolutions developed in the centre. The organism is named *Trichophyton coccineum* [*R.A.M.*, x, p. 596] var. *keio* n.var. It was mildly pathogenic on the skin of laboratory animals.

KESTEN (B[EATRICE] M.), ASHFORD (B. K.), BENHAM (R[HODA] W.), EMMONS (C. W.), & MOSS (M. C.). **Fungus infections of the skin and its appendages occurring in Porto Rico. A clinical and mycologic study.**—*Arch. of Dermatol.*, xxv, 6, pp. 1046–1057, 5 figs., 1932.

An account is given of the fungi isolated from 59 out of 80 cases of skin diseases in Porto Rico. These include *Trichophyton gypseum*, *T. plicatile* [*R.A.M.*, x, p. 106], *Endodermophyton tropicale* [*T. concentricum*: ibid., x, pp. 243, 665], *Epidermophyton inguinale* [*E. floccosum*: ibid., xi, p. 458], and *Microsporon lanosum* [ibid., xi, p. 373]. A species of *Hormodendrum* (? *H. olivaceum* or *H. fontoynonti*) [ibid, vii, p. 639], with olive-green mycelium, conidiophores, and conidia, the latter measuring 3·2 to 5·6 by 2·4 to 3·5 μ, was isolated from the squamae of persons affected by superficial depigmentation. *Sporotrichum gougeroti* [see next abstract] was isolated from a case of deep infection of the skin clinically resembling the ecthymatous type of acladiosis (Castellani) [due to *Acladium castellanii*: ibid., vii, p. 240].

BENHAM (RHODA W.) & KESTEN (BEATRICE). **Sporotrichosis: its transmission to plants and animals.**—*Journ. Infect. Dis.*, l, 5–6, pp. 437–458, 15 figs., 1932.

After a brief survey of the history of sporotrichosis in man, animals, and plants, a consideration of the possible sources of human infection, and notes on the classification of species of *Sporotrichum*, the writers give a full account of their studies in New York on *S. schenckii* [*R.A.M.*, i, p. 353; x, p. 106], *S. beurmanni*, *S. gougeroti*, *S. councilmani*, *S. poae* and *S. pruinosum*.

S. beurmanni, isolated from a case of human sporotrichosis, is characterized by creamy, later tan to brown or black colonies with

radiating folds or irregular cerebriform ridges; fine, hyaline, slightly branched hyphae, 1 to 2 μ in diameter; oval or piriform, often dark spores, 3 to 5 by 2 to 4 μ, occurring singly or in clusters on short lateral branches or attached to the sides of the longer hyphae by sterigmata; and abundant coremia. *S. gougeroti*, isolated from a Porto Rican case of sporotrichosis [see preceding abstract] produces round, friable colonies with a smooth, black, velvety surface; a coarse mycelium, often moniliform and pigmented; spores measuring 5·5 by 3·5 μ, often sessile; and budding forms detached from the mycelium. *S. councilmani*, isolated from a case of human sporotrichosis, in Sabouraud's collection, produces tan-coloured colonies, later covered with a coarse, white mycelium, and rounded spores, 4 to 8 μ in diameter, borne terminally on conidiophores. *S. poae*, isolated from diseased carnations (*Science*, N S., xxi, p. 389, 1905), is characterized by white, fluffy colonies with pink edges on sugar media, coarse hyphae and oval or round, sessile spores, 5 to 9 μ in diameter, arranged in clusters on lateral branches. The colonies of *S. pruinosum* from Iowa soil [*R.A.M.*, vii, p. 57] are slightly membranous, with coarse hyphae, oval or lemon-shaped spores, 9·5 to 13·5 by 6 to 10 μ, borne terminally on branched conidiophores, and numerous chlamydospores.

S. beurmanni, inoculated through wounds into carnation buds, caused a disease resembling spontaneous bud rot in 19 out of 21 cases. The tip of the bud appeared to darken and the calyx to shrivel, while the tissue within the calyx showed a typical soft rot. The organism was demonstrated in the petals and stamens and was recovered in culture. Inoculations on unwounded buds gave negative results. Inoculated into a living rosebud, *S. beurmanni* caused complete rotting. *S. poae*, *S. pruinosum*, *S. councilmani*, and *S. gougeroti* also proved pathogenic to carnation buds (55, 50, 61, and 50 per cent. infection, respectively).

Rats inoculated with *S. beurmanni* after its passage through carnations developed abscesses, tumours, and bone lesions from which the organism was recovered. *S. poae* proved entirely avirulent for rats, while *S. pruinosum*, though producing multiple abscesses in these animals, retained its original morphology in culture and bore little resemblance to any *Sporotrichum* isolated from human sources. It is improbable, therefore, that these species can cause disease in man. The experiments with *S. beurmanni*, however, showing as they do (apparently for the first time) that a human pathogen can infect a plant, open up the possibility that the latter may act as a source of human infection. This supports the view, based on many clinical observations, that sporotrichosis in man results from the contamination of a wound with infected living or dead plant material.

NAOUMOVA (Mme N. A.). Пятнистость стеблей Льна, вызываемая **Ascochyta linicola Naoumoff et Vassilievski.** [Stem spot of Flax caused by *Ascochyta linicola* Naoumoff et Vassilievski.] —*Bull. Plant Protection*, Leningrad, v, 1, pp. 141–160, 2 pl., 3 figs., 1932. [English summary.]

This is a detailed account of experiments in 1930 in the district

of Leningrad for the purpose of elucidating some points in the biology of *Ascochyta linicola* [*R.A.M.*, ix, p. 246; x, p. 731] on flax. It was conclusively shown that the chief source of infection is the soil, although dissemination on infected seed was also demonstrated. The frequency and severity of attack on flax seedlings were less marked when the inoculum (pure cultures of *A. linicola* from three localities) was worked into the soil together with healthy seeds at a depth of 2 cm. than when a layer of 0·5 or 1 cm. clean earth was left between the seed and the inoculum above. From the soil the mycelium developed upwards along the underground parts of the growing seedlings (21·8 to 47·4 per cent. of which were killed before emergence), and formed fructifications at the base of the plants. While heavily infected seedlings soon perished, the more slightly attacked ones were merely delayed in their development but remained stunted throughout their life. Only the cortical tissues of the underground parts were attacked and destroyed by the fungus, the degree of destruction being largely dependent on the relative humidity of the soil, the optimum (both for intensity of attack and for growth of the host) being 60 per cent. of the total water-holding capacity; at 40 and 30 per cent. the fungus developed but slightly and did not injure the seedlings. Air temperature had no apparent influence either on the severity or incubation period of the disease. Artificial inoculations showed that the susceptibility of the flax stems to infection decreased with advancing age, plants over 50 days old (from sowing) being susceptible to infection only through wounds in the cortex. Stem infections developed equally well at all temperatures above 8° C.; below this the disease made but slight progress, and the maximum limit of the extension of the mycelium in the cortical tissue (marked by pycnidial formation) was 5 to 6 cm. upwards from the point of infection. The effect of infection on the growth of the host was dependent in a great measure on the age of the latter: before flowering it usually results in the death of the plant, but later only inhibits the development of fresh organs, such as the bolls and seeds.

Inoculation of the seed bolls showed that the susceptibility of these also decreased as they approached maturity. Under favourable conditions the fungus grew through the walls of the bolls and continued to develop on and in the dissepiments, from which it gained access to the seeds. In the latter the organism was localized in the upper layers of the integument, the formation of pigment inhibiting its further progress inside the seeds. The embryo was only attacked in very young seeds. It was further shown that in the seed the fungus overwinters as mycelium, rarely in the pycnidial stage. The germinability of heavily infected seeds was considerably lowered in comparison to that of healthy seed, and the fungus passed freely from the diseased seed to the seedlings.

FLACHS (K.). **Krankheiten und Parasiten der Zierpflanzen. Ein Bestimmungs- und Nachschlagebuch für Biologen, Pflanzenärzte, Gärtner und Gartenfreunde.** [Diseases and parasites of ornamental plants. A book of identification and

reference for biologists, plant pathologists, gardeners, and garden-lovers.]—558 pp., 173 figs., Stuttgart, Verlag Ulmer, 1931. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxvi, 8–15, pp. 272–273, 1932.]

This is stated to be a comprehensive account of the diseases and pests of over 150 ornamental plants [cf. *R.A.M.*, xi, p. 245], the various organs of which are discussed in the separate sections. The plants are arranged in alphabetical order of their scientific names, an index of the corresponding German names being given. The fungi and pests enumerated are accompanied by diagnoses and descriptions, control measures being indicated where they are known. An appendix contains a brief list of prophylactic and therapeutic remedies, together with directions for the preparation of sprays and notes on the substances officially tested by the German Plant Protection Service.

WHITE (R. P.). **Diseases of Boxwood, Carnations, China Asters, Chrysanthemums, Delphinium or Larkspur, Gladiolus, Hollyhocks, Iris, Laurel, Peonies, perennial and annual Phlox, Roses, Snapdragons, Sweet Peas, and Tulips.**—*New Jersey Agric. Exper. Stat. Circs.* 230–244, 62 pp., 42 figs., 1931. [Received July, 1932.]

Popular notes are given on the symptoms and control of the diseases of the various flowering or ornamental plants mentioned in the title occurring in New Jersey, the diseases of each host being dealt with in a separate circular. Laurel [*Kalmia latifolia*] is stated to be subject to a leaf spot caused by *Phyllosticta kalmifolia* and leaf blight due to *Phomopsis kalmiae*.

VERPLANCKE (G.). **Une maladie à virus filtrant du Pelargonium zonale.** [A disease of *Pelargonium zonale* due to a filterable virus.]—*Bull. Cl. Sci. Acad. Roy. de Belgique*, Sér. 5, xviii, 3, pp. 269–281, 1 pl., 1932.

Previous references to the occurrence of an obscure virus (leaf curl or mosaic) disease of *Pelargonium zonale* in Germany and Switzerland [*R.A.M.*, vi, p. 729; xi, p. 459] are briefly summarized, and a full account is given of the writer's investigations on a similar phenomenon at Laeken, Belgium.

Angular yellow spots, sometimes star-shaped, occur along the secondary veins of the leaves, which are generally much curled; the centre of the lesion may be whitish, or more often necrotic, and a second star may develop around the first, the two being separated by a narrow strip of tissue. The size of the lesions ranges from $\frac{9}{25}$ to $\frac{3}{4}$ mm. A clearing of the finer veins was observed in some of the young leaves. A very inconspicuous mottling occurs chiefly near the margins of fully developed leaves, while on young ones pale yellow spots, not more than 1 mm. in diameter, often with necrotic centres, may be detected. Certain plants exhibit only livid, translucent, oily, circular spots, up to 4 or 6 mm. in diameter, the centre of which is a normal green surrounded by a paler zone. Both *P. zonale* and *P. hederaceum* exhibit these symptoms.

In the oily spots the palisade parenchyma is not differentiated and there are no lacunae in the spongy parenchyma. The tissue of the star-shaped lesions also consists of a parenchyma of undifferentiated cells.

Infection was not transmissible from diseased to healthy pelargoniums by wounding, rubbing, or root contact, but grafting experiments gave positive results. Inoculated into tobacco plants by wounding or rubbing, the *Pelargonium* virus produced diffuse discoloured lesions on the leaves. The virus of tobacco mosaic was also inoculated by various standard methods into *P. zonale* plants with positive results in up to 40 per cent. of the plants tested.

DODGE (B. O.) & SWIFT (MARJORIE E.). **Black stem-rots and leaf-spots of Pelargonium.**—*Journ. New York Bot. Gard.*, xxxiii, 389, pp. 97–103, 2 figs., 1932.

Many of the new zonal varieties of *Pelargonium* at the New York Botanic Garden have been attacked by a bacterium producing a black stem rot and spotting of the leaves, sometimes followed by defoliation. Of 31 inoculations made with pure cultures of the organism, which may be identical with *Bacterium pelargonii* [*R.A.M.*, x, p. 461], 28 were successful. One seedling was infected by *Pythium splendens* [ibid., xi, p. 330], also causing a black rot of the stems, which shrivel and collapse more rapidly than those attacked by the bacterium, besides bearing darker lesions. Control measures are briefly indicated.

ROTH (E.). **Verbreitete Cyklamenkrankheiten.** [Widespread Cyclamen diseases.]—*Gartenwelt*, xxxv, pp. 592–593, 1931. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxvi, 8–15, p. 342, 1932.]

Cyclamens in Germany are liable to infection by *Phyllosticta cyclaminis* [*R.A.M.*, ix, p. 786], causing yellowish to brownish spots on the leaves, mostly with a reddish-brown border, which later shrivel and drop out. Of more frequent occurrence is *Septoria cyclaminis* [ibid., vi, p. 164], producing red, concentrically zonate, later grey, circular lesions on the foliage. The spots formed by *Gloeosporium cyclaminis* on the leaves are distinctly zonate, watery, pale green, and circular. In addition to the provision of favourable growing conditions, applications of 1 per cent. Burgundy mixture should be given to control these diseases.

LANDGRAF (T.). **Eine bedenkliche Azaleenseuche.** [A serious Azalea disease.]—*Die kranke Pflanze*, ix, 4–5, pp. 42–43, 1 fig., 1932.

A brief, popular note is given on the occurrence of a *Pestalozzia*, probably *P. guepini*, on the leaves, stems, and branches of *Azalea indica* [*Rhododendron indicum*] at Hamburg [*R.A.M.*, x, p. 705]. The disease assumed epidemic proportions and future outbreaks should be prevented by the application of copper-containing fungicides, e.g., vomasol C, azurin, kurtakol [ibid., x, p. 58], and sulphur-celestina.

Nicolas (G.) & Aggéry (Mlle). **Champignons observés sur deux Viburnum de la section tinus (Viburnum davidi, Vib. tinus).** [Fungi observed on two species of *Viburnum* of the section *tinus* (*Viburnum davidi*, *V. tinus*).]—*Bull. Soc. Hist. Nat. Toulouse*, lxi, 2, pp. 249–252, 1931.

Viburnum davidi leaves in the Toulouse Botanic Garden were observed in 1929 to bear necrotic spots, grey on the upper and reddish-brown on the lower side, with a purplish-brown margin, often falling out and giving a shot-hole appearance to the foliage. Infection takes place through the upper leaf surface. In the tissues of young spots a pale yellow mycelium and numerous small, brown sclerotia may be detected; the latter develop into light brown pycnidia, measuring 117 by 78 μ, with a circular ostiole, through which the hyaline, fusiform, uni- or bi-, occasionally triseptate pycnospores are extruded, their average dimensions being 10 to 11 by 2·5 to 2·8 μ (uniseptate) or 13 by 2·5 to 2·8 μ (triseptate). The fungus appears to be identical with *Ascochyta tini*, occurring on the leaves of *V. tinus* in Italy and Portugal.

The dead tissues of the above-mentioned lesions were invaded by a black mycelium, producing pycnidia measuring 95 to 150 by 78 to 100 μ, with continuous, brownish pycnospores, 2·6 to 5·2 by 2·6 to 3 μ, presumably belonging to *Coniothyrium viburni* Hollós, which is found on dry branches of *V. opulus* in Hungary.

A third fungus, characterized by a coarse, blackish mycelium, brown to black, flattened pycnidia, 140 to 180 by 115 to 150 μ, and hyaline, ovoid or elliptical pycnospores, 10·4 to 13·5 by 5·2 to 6·5 μ, is also found in the desiccated portions of the lesions and is identified with *Macrophoma gloeosporioides* (Sacc.) Berl. & Vogl., previously observed on *V.* sp. in the south of France.

A. tini is obviously an active parasite of *Viburnum* leaves, while the two other organisms are considered to be purely secondary.

Roeder (W. v.). **Die Pilzbekämpfung bei Kakteensämlingen.** [The control of fungi in Cactus seedlings.]—*Blumen- und Pflanzenbau*, xlvii, 6, pp. 88–89, 1 fig., 1932.

Cactus seedlings are stated to be frequently infected by fungi, e.g., *Phytophthora*, which retard their growth and may even render them unmarketable. The writer has obtained excellent control of these organisms by watering the seed-beds with quinosol (ortho-oxy-quinolin-potassium sulphate) [see above, p. 622]. This preparation may be applied either in the form of chinosolum purissimum (2 gm. per 1,000 c.c. water) for large-scale experiments, or as 'chinoblettes' (2 or 4 per l.). Quinosol is absolutely harmless to the plants, causing no injury to three-year-old seedlings at a strength of 5 per cent., and is applicable also to other succulent and Alpine plants.

Antokolskaya (Mme M. P.). О расах **Sclerotinia libertiana Fckl.** на Подсолнечнике и на других растениях. [The races of *Sclerotinia libertiana* Fckl. on the Sunflower and other plants.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 39–62, 7 pl., 2 graphs, 1932. [English summary.]

A full account is given of the author's continued investigation

of the disease of sunflowers caused by *Sclerotinia libertiana* [*S. sclerotiorum*] in Russia [*R.A.M.*, vi, p. 730]. Cultural experiments in which sclerotia obtained from various regions of the country were grown on a number of natural and artificial media, confirmed the existence of at least two geographical strains of the fungus, namely, a northern and a southern (or Caucasian) race. Under controlled conditions the former was characterized by a poorly developed aerial mycelium and the formation of numerous sclerotia and appressoria on all the media tested, and also by the fact that no apothecia were produced in cultures on oat grains. The southern race gave an abundant mycelium with relatively few sclerotia; no appressoria were formed either on plum agar or oat and wheat grains, and apothecia developed in large numbers on oat grains and oat agar cultures. Although the sizes of the ascospores of the two races were included within the same limits, an analysis by the statistical variation method showed a significant difference in the mean length and width of the spores, but not sufficient to warrant the specific separation of the two races, the more so that the difference could not be detected by simple biometric measurements. Cultures raised from sclerotia obtained from central Russia showed characters intermediate between those of the northern and southern races. Inoculation tests (carried out for one year only and therefore requiring confirmation) showed that sunflowers, tobacco, Jerusalem artichokes (*Helianthus tuberosus*), and hemp (*Cannabis sativa*) are more easily and heavily infected by the southern strain than by the northern, while of the strains isolated from hemp, lupins, potato, safflower (*Carthamus tinctorius*), and tobacco, only that from hemp was pathogenic to the sunflowers.

JAVORONKOVA (Mme I. P.). Бактериальная болезнь корней Клевера, Люцерны и Чечевицы, вызываемая **Bacterium radiciperda n. sp.** [Bacterial root rot of Red Clover, Lucerne, and Lentils caused by *Bacterium radiciperda* n. sp.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 161–172, 4 pl., 1932. [English summary.]

A brief account is given of a bacterial root rot which was first noticed in 1930 on red clover (*Trifolium pratense*) in the governments of Tver and Orel, Central Russia, and has since been found also to occur on the roots of lucerne and lentils (*Lens esculenta*) in other central districts, in Wolhynia, and in the Lower Volga basin. As seen on red clover in the first year of infection the disease is characterized by the appearance on the collar and at the base of the stems of oblong, dark lesions, under which the vascular bundles are browned and the vessels are filled with bacteria; in the second year the symptoms are intensified and the mortality of the plants may reach 80 per cent., and in the third year the whole of the infected crop is destroyed. The symptoms on lucerne and lentils are not described in detail, but are stated to be very similar to those on clover.

Inoculation experiments confirmed the pathogenicity of the bacterium present in the lesions to all the three hosts mentioned, and indicated that it gains entry through mechanical and insect

injuries to the aerial and underground parts of the plants, while field observations suggested that insects play a considerable part in the dissemination of the disease. A very similar disease was also observed on sainfoin [*Onobrychis viciaefolia*], but the pathogenicity of the organism responsible for this disease has not yet been tested on the other three hosts.

The red clover bacterium, which was isolated and cultured on various media, is named *Bacterium radiciperda* n. sp., with a diagnosis in Russian and English. It is a short, Gram-negative, aerobic rod, rounded at both ends, with two polar cilia, 1 to 2 by 0·8 μ, occurring in pairs or singly; it forms capsules but does not sporulate. On peptone beef-agar the colonies are round, smooth, shining, slightly raised, at first white and later pale yellow. The organism liquefies gelatine, breaks down sugars to acids without production of gases, peptonizes milk, does not form indol, but produces ammonia and hydrogen sulphide. Its optimum temperature for growth is 23° to 25° C., and the thermal death point is 50°.

CORNELI (E.). **Sopra una grave alterazione della Medica prodotta da 'Phyllosticta medicaginis' Fuck. a Perugia.** [On a serious infection of Lucerne caused by *Phyllosticta medicaginis* Fuck. at Perugia.]—*Riv. Pat. Veg.*, xxii, 3–4, pp. 51–58, 1 pl., 1932.

In April, 1931, an extensive area of lucerne growing near Perugia became severely attacked by a disease which produced a necrotic zone at the base of the leaf stalks, causing the leaves to become yellow and wither. Blackish, elongated spots were frequently present on the stalks, and the young leaves when directly attacked showed yellowish spots surrounded by a dark halo. The floral shoots also occasionally withered. Five years previously the disease had been observed near Rome; but it did not reappear after the first crop had been cut, as was also the case at Perugia.

The lesions bore globose, ochraceous, ostiolate pycnidia 100 to 170 μ in diameter. The rod-shaped, hyaline, straight or slightly curved, continuous, or, occasionally, uniseptate spores averaged 5 to 7 by 2·5 to 3 μ. In hanging drop cultures in water the pycnospores after 24 hours measured 8 to 14 by 3 to 4·5 μ; they were mostly transversely septate and slightly constricted at the septum. In 2 per cent. glucose solution septation was much less common and in carrot decoction it was exceptional. On the latter medium the mycelium was olivaceous and pycnidia were produced in 3 days; these pycnidia were up to 350 μ in diameter, variable in shape, and generally without an ostiole.

The author considers that in view of the variability of the spores, some doubt might exist as to whether the organism is a *Phyllosticta* or an *Ascochyta*. He rejects *A. medicaginis* Bres., specific to *Medicago lupulina*; *A. imperfecta* Peck., which has different spore dimensions and symptoms though it frequently shows unicellular spores; and *A. pisi* var. *medicaginis* Sacc., referred provisionally by Sprague to *A. imperfecta* Peck. [*R.A.M.*, ix, p. 274]; but considers his fungus agrees with *P. medicaginis* (Fuck.) Sacc. (*A. medicaginis* Fuckel) in view of the almost constant formation of

unicellular spores both on the natural host and on some artificial media and their germination on suitable media without previous septation. The disease of lucerne attributed by Rosella to *A. medicaginis* Fuck. [ibid., ix, p. 249] is considered to be distinct, as Rosella's fungus had much larger spores.

Artificial inoculation quickly gave positive results under damp but not under dry conditions.

KHOKHRYAKOFF (M. K.). **Микологические заметки.** [Mycological notes.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 125–129, 1932. [French summary.]

In these notes the author points out that the binomial *Ascochyta trifolii* [for a clover leaf-spotting fungus: *R.A.M.*, vi, p. 99; viii, p. 339] was used by Bondartzeff and Mme Troussova to name a fungus described by them in 1913, and by Siemaszko in 1914 to rename *Phleospora trifolii* Cav. var. *recedens* Massalongo. A careful examination of type material of these two species has convinced him of their identity, and the presence in their stylospores of two or three transverse septa leads him to transfer the organism, in agreement with the taxonomy suggested by Diedecke, into the genus *Stagonosporopsis*. The fungus should henceforth be known under the new combination *S. trifolii* (Cav.) Khokhr.

STIRRUP (H. H.). **Sclerotium rhizodes Auersw. in England.**—*Trans. Brit. Mycol. Soc.*, xvi, 4, p. 308, 1932.

In this note the author reports what appears to be the first record of *Sclerotium rhizodes* [*R.A.M.*, xi, p. 191] from England. The fungus was found attacking and killing the grasses (mainly *Agrostis* spp.) in a meadow about 400 ft. above sea-level in a district of North Derbyshire where rainfall is usually high and the soil is very poor and sour.

Spraying program and pest control in the orchard.—*Ohio Agric. Exper. Stat. Bull.* 500, 8 figs., 4 diags., 4 maps, 1932.

Spray calendars are given for the control of apple, pear, plum, peach, cherry, and grape diseases in Ohio, supplemented by diagrams showing how differently laid out orchards can best be reached by the sprayers. Maps show the distribution in the State of scab [*Venturia inaequalis*], Brooks's spot [*Mycosphaerella pomi*: *R.A.M.*, xi, p. 428], bitter rot [*Glomerella cingulata*], and blotch [*Phyllosticta solitaria*] of the apple.

VERGUIN (J.). **La propagande pour les traitements insecticides et anticryptogamiques des arbres fruitiers dans la région lyonnaise.** [Propaganda for the insecticidal and fungicidal treatments of fruit trees in the Lyons district.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 16, pp. 580–585, 1932.

Further details are given concerning the methods of propaganda employed in the dissemination of instruction on the control of fruit diseases and pests in south-eastern France [*R.A.M.*, xi, p. 246]. During 1931 some thirty machines were distributed among the co-operative organizations in nine departments for experimental

treatments. Between 21st December, 1931, and 22nd March, 1932, 66 demonstrations were held in ten departments, and it is estimated that 4,600 fruit growers have been directly reached by these methods. In one parish in the Loire department 600 l. of anthracene oil were used in the preparation of Bordeaux-oil emulsion mixture in 1930–1 and nearly 2,000 l. in 1931–2.

COUPAN (G.). **Le matériel pour le traitement des arbres fruitiers.** [The apparatus for the treatment of fruit trees.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 18, pp. 621–629, 1932.

In connexion with the campaign now in progress in south-eastern France for the rational treatment of fruit trees against insect pests and fungous diseases [see preceding abstract], some technical details are given of various types of knapsack and motor sprayers tested for these purposes. It was found that, with motor sprayers, perfect results were given only at very high pressures (19 and 28 kg. per sq. cm., nozzle of 1·2 mm. in diameter, and 44 kg., nozzle 2 mm.) [cf. *R.A.M.*, xi, p. 523], though a very good action was obtained at 20 kg. per sq. cm., nozzle 2·0 mm., and at 15 kg., nozzle 1 mm. The best knapsack sprayers were worked at pressures of 4 to 12 kg. with a 2 mm. nozzle or 5 to 10 kg., 1·2 mm. nozzle. A few figures are also given for hand sprayers and for those worked with compressed air.

CUNNINGHAM (G. H.). **Orchard sprays in New Zealand. II. The lime-sulphur series.**—*New Zealand Journ. of Agric.*, xliv, 4, pp. 263–269, 1932.

Continuing his discussions of the orchard sprays commercially used in New Zealand for the control of pests and diseases of orchard trees [*R.A.M.*, xi, p. 582], the author deals with the lime-sulphur series. A useful feature is a table indicating the number of gallons of water to be added to one gallon of concentrated lime-sulphur solution to make a spray of desired strength, irrespective of the brand used, provided the polysulphide content is known. Self-boiled lime-sulphur and dry-mix sulphur-lime are only mixtures of lime and sulphur with a spreader, their fungicidal efficacy being governed solely by the content and type of the sulphur used; colloidal sulphur at the rate of 2 to 4 lb. per 100 galls. water may be advantageously substituted for them. The same is true of the dry lime-sulphur which has been recently put on the market by some United States manufacturers, because of its uncertain composition and high price.

KORDES (H.). **Neue Ergebnisse über die Entwicklung des Erregers der Mauke an Reben und des Wurzelkropfes der Obstbäume und deren Bekämpfung.** [New data on the development of the causal organism of 'mauke' on Vines and of crown gall of fruit trees and their control.]—*Nachricht. über Schädlingsbekämpf.*, vii, 2, pp. 59–66, 7 figs., 1932.

A popular account is given of the history of vine 'mauke' and crown gall of fruit trees in Germany, both caused by *Bacterium tumefaciens* [*R.A.M.*, v, p. 493; vi, p. 147; ix, p. 764], and of recent investigations on the etiology and control of these diseases.

BALAKHONOFF (P. I.). Черный рак плодовых деревьев, **Physalospora malorum (Arn.)—Sphaeropsis malorum Peck.** [Black canker of fruit trees, *Physalospora malorum* (Arn.)—*Sphaeropsis malorum* Peck.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 3–38, 3 pl., 5 figs., 1 graph, 1932. [English summary.]

This is a considerably expanded version of the author's account of black canker (*Physalospora malorum*) [*P. cydoniae*] of pomaceous trees in the south-east of Russia and north Caucasus [*R.A.M.*, ix, pp. 252, 253], where the disease is stated to be continuing its ravages almost unabated, chiefly owing to the inadequate control measures taken by the local growers. A detailed description is given of the lesions caused by the fungus on the various organs of the trees, with particular reference to those on the bark as the most dangerous form of the disease, and it is stated that in 1929 the organism was observed on the Black Sea littoral of the Caucasus causing a severe blight of pear blossoms, very similar to that caused by *Sclerotinia cinerea* [ibid., x, p. 605]. Control measures, both preventive and curative, are discussed in some detail. The bibliography appended comprises 67 titles.

BROWN (NELLIE A.). **Some pathological studies on Apple cankers.** *Phytopath.*, xxii, 5, pp. 397–414, 2 figs., 1932.

Gloeosporium perennans, hitherto considered to be the causal organism of perennial canker of apples in the Pacific Northwest [*R.A.M.*, xi, p. 248], was not found to be constantly present in otherwise typical cankers. Other fungi and a white bacterium were frequently observed, sometimes in association with *G. perennans*, but just as often without it. Inoculated into apple trees in the Hood River Valley, Oregon, *Alternaria*, *Fusarium*, *Dematium*, *Cladosporium*, and *Penicillium* spp. and the white bacterium produced typical cankers, whereas similar experiments in Virginia gave negative results. *G. perennans* did not infect more readily than the other organisms. In some cases there was canker growth during the autumn following inoculations made with it in the spring of 1929, but no fresh canker development occurred in the next spring. The inoculations made in the spring of 1930 with bacteria and fungi (including *G. perennans*) isolated the year before were mostly healed over when examined in 1931. The winter of 1930–1 was mild and no natural cankers occurred in the Hood River Valley orchards during the following spring and summer.

G. perennans was not used for inoculations in Virginia owing to the risk of introducing the disease into a region hitherto free from it, but *G. musarum* [ibid., xi, p. 382] and *G. cyclaminis* [ibid., ix, p. 186] failed to infect apples in that State, presumably on account of local climatic conditions. Since the cold winter of 1920–1 it has been observed that perennial canker is prevalent in regions subject to low temperatures. Therefore, judging from field observations, the reports of other workers, and the absence of cankers following the mild winter of 1930–1, it is concluded that the disease springs primarily from winter injury, in which the woolly aphis [*Eriosoma lanigerum*] plays a part. The organisms

responsible for canker formation appear to be capable of growth and perpetuation only under the changed conditions obtaining in the cells of winter-injured tissues.

LAUBERT (R.). **Was sollte der Obstzüchter über die sooty-blotch- und fly-speck-Krankheit (Russflecken und Fliegenflecken-Krankheit) der Äpfel wissen?** [What should the fruit grower know about the sooty blotch and fly speck disease of Apples ?]—*Mitt. Gesellsch. für Vorratsschutz*, viii, 3, pp., 31–34, 1 fig., 1932.

During the winter of 1929–30 the writer examined apples from the Stade [Schleswig-Holstein] district of Germany bearing sooty blotch spots (*Gloeodes pomigena*, formerly known as *Phyllachora pomigena*, *Asteroma pomigenum*, and *Dothidea pomigena*), which is sometimes considered to be merely a stage in the life-history of *Leptothyrium* (*Labrella*) *pomi*, the causal organism of fly speck [cf. *R.A.M.*, xi, p. 560]. Usually both types of spotting are represented on the same fruit, as in the case of Ananas Reinette apples examined in Germany in 1909, but in the recent above-mentioned consignments only *G. pomigena* was detected. These together with isolated records in 1930 and 1931 appear to be the sole authentic occurrences of fly speck and sooty blotch in Germany, where these blemishes are of little practical importance except as detracting from the market value of the fruit.

WORMALD (H.). **Botrytis cinerea on Apple roots.**—*Trans. Brit. Mycol. Soc.*, xvi, 4, pp. 309–310, 1932.

A brief account is given of a root rot, caused by *Botrytis cinerea*, which was observed at the end of January, 1932, on one-year-old plants of the apple stock East Malling No. 7 which towards the end of the preceding October had been bedded in an apparently healthy condition at the East Malling Research Station. Nearly every stock had one or more main roots dead; some of the dead roots bore sclerotia from 1 to 4 mm. in length, while others bore tufts of *B. cinerea*, and conidiophores were growing out from one of the sclerotia. The condition was only seen on the stocks of this variety, possibly because it produces more fibrous roots than the others used at East Malling, and these may retain an excessive amount of moisture.

ALLEN (T. C.) & RIKER (A. J.). **A rot of Apple fruit caused by Phytomonas melophthora, n. sp., following invasion by the Apple maggot.**—*Phytopath.*, xxii, 6, pp. 557–571, 2 figs., 1932.

A bacterial rot of Wisconsin apple fruits infested by the apple maggot, *Rhagoletis pomonella*, has been observed both in the orchard and in storage. Diseased apples in an advanced stage of decay consist of a fairly firm but shrunken, dark brown mass of rotted tissue. Ripe fruit and sweet, mellow varieties, such as Delicious, Wealthy, and Dudley were found to be more liable to this type of rot than green apples and those of firmer varieties, e.g., Northwestern Greening. Positive results were given by two series of inoculation tests on Wealthy and other varieties with

pure cultures of the bacteria isolated from decaying apples and from the larvae and adults of the maggot.

The causal organism, to which the name of *Phytomonas melophthora* n. sp. is given, is a rod measuring 0·8 to 1·9 by 0·6 to 1·0 μ (average 1·32 by 0·68 μ), motile by means of two polar flagella, Gram-variable, and without spores. Incubated at 20° C. for three days on nutrient glucose agar the colonies were circular, smooth, glistening, convex, finely granular, opaque, and of a light pink colour. Gelatine was not liquefied, starch was not hydrolyzed, and nitrates were not reduced. Acid was formed from arabinose, glucose, galactose, sucrose, levulose, and glycerine, and traces from maltose and mannitol. Growth was most profuse between 21° and 25°.

Baker (K. F.) & Heald (F. D.). **The importance of lenticel infection of Apples by Penicillium expansum.**—*Washington Agric. Exper. Stat. Bull.* 264 (*Tech. Paper*), 15 pp., 3 pl., 1932.

Observations during the last six years at the Washington Agricultural Experiment Station have shown that the blue mould of apples (*Penicillium expansum*) [*R.A.M.*, x, p. 674] is able to penetrate uninjured fruit through the lenticels much more commonly than has been reported in the literature. In spite of stricter grading requirements and improvements in packing equipment since 1925 the annual loss from blue mould has remained fairly constant during this period. Probably certain lenticels on all apples permit infection and evidently certain factors, as yet unknown, tend to increase the prevalence of such lenticels in certain lots of fruit. Lenticel infection, which has been observed in the Jonathan, Delicious, Winesap, Rome Beauty, Arkansas Black, Spitzenberg, King David, and Yellow Newtown varieties, may be one of the principal factors involved in cases of high percentages of fruit rot observed at eastern termini in the United States. Probably the best hope of control lies in the adoption of treatments making for a reduction in the spore load of the fruit, e.g., sanitary practices in harvesting, cleaning, and packing.

Stevens (N. E.) & Nance (Nellie W.). **Efficiency of oiled wraps in the commercial control of Apple scald.**—*Phytopath.*, xxii, 6, pp. 603–607, 1 graph, 1932.

An attempt has been made to evaluate the actual commercial efficacy of oiled wraps [*R.A.M.*, iii, p. 341 and next abstract] in the control of apple scald [ibid., x, p. 114; xi, p. 54] in Washington, the study being based on information supplied by the Food Products Inspection Service of the Bureau of Agricultural Economics, United States Department of Agriculture.

According to C. Brooks (*Official Proc. Internat. Apple Shippers' Assoc.*, xxix, p. 154, 1924), about 600,000 boxes of apples of the 1922 crop went into storage in oiled wraps; in 1923 some 15,000,000 bushels were so treated, and by 1924 the practice was almost universal in Washington and had been adopted to some extent throughout the country. Calculated on the basis of all cars inspected (over 20,000), the percentage of scald in 1922 was 2·8 or slightly below the average for 1917–20; in 1923 it fell to 0·7, and

during the succeeding years the average has been below 0·3 per cent. The number of inspected cars showing scald subsequent to 1923 has averaged only 2·5 per cent. compared with 16·4 and 5·3 per cent. in 1922 and 1923, respectively. No comparable improvement has occurred as regards the losses caused by blue mould [*Penicillium expansum* and other species: ibid., x, p. 674 and preceding abstract], the extent of which was somewhat less than those from scald before the control method was developed, but very much larger under subsequent conditions.

It is significant that the number of inspections requested fell in 1924, after oiled wraps came into general use, to half that demanded in 1922.

ARNAUD (F. W. F.). **Oiled wraps for Apples.**—*The Analyst*, lvii, 674, pp. 307–308, 1932.

Heavy losses among apples stored in an atmosphere of carbon dioxide gas are liable to occur from scald unless the fruit is enclosed in oiled wraps [see preceding abstract]. The minimum amount of oil (medicinal paraffin) required to render these wraps efficacious does not appear to have been determined either experimentally or practically, though 18 per cent. is always recommended. The examination (at the Maidstone County Analyst's Laboratory) of several different consignments of American wraps revealed amounts of oil ranging from 11·5 to 14·9 per cent. All these wraps had been used with success. The oil content of bundles of oiled wraps has been found to remain constant for three months under controlled conditions, but on exposure to the air at ordinary temperatures losses of oil amounting to over 3 per cent. were registered. The writer is convinced, moreover, from an examination of oiled wraps used on apples in a gas store, that considerable quantities of oil are exuded in practice.

SALMON (E. S.) & WARE (W. M.). **Scab on the spur wood and bud scales of the Pear.**—*Gard. Chron.*, xci, 2372, pp. 446–447, 2 figs., 1932.

Between 5th and 11th May, 1932, 20-year-old Roosevelt bush pears at Wye, Kent, showed severe scab (*Venturia pirina*) infection [*R.A.M.*, vi, pp. 12, 212, 672] on all the blossom trusses, the sites of invasion being the pedicels, fruitlets, sepals, and occasionally the petals and main axis of the inflorescence. No infection was observed on the leaves until the 14th May. Pustules of the fungus were present in groups on the one-year-old part of the spur, near or on the leaf scars, and in some cases on the lowest bud scales. No isolated pustules, however, were detected on the scales as in the case of apple scab [*V. inaequalis*: ibid., x, p. 737]. The fact that the scab pustules are found at the extreme apex of the year-old part of the spur suggests that they are the result of summer, rather than spring infection in 1931, while their proximity to the leaf scars in 1932 indicates the conveyance of the conidia to the stem by rain water from the leaf blades or petioles in 1931. A similar occurrence of pustules on one-year-old spur wood was observed on the Fertility, Durondeau, Dr. Jules Guyot, Emile

Heyst, Conference, and Marie Louise d'Uccle varieties, the lowest bud scales also being involved in the two first-named.

The presence of infection on the one-year-old spur wood may require a modification of the accepted methods of scab control, giving only one pre-blossom fungicidal application instead of two, and three after flowering. All infected breastwood should be excised. The prevention of the establishment of infection in the wood by efficient spraying of the foliage must be relied upon rather than seeking a cure.

CURINI-GALLETTI (A.). **Sul mal della gomma. Ricerche, considerazione e commenti.** [On gummosis. Researches, investigations, and comments.]—*Riv. Pat. Veg.*, xxii, 1–2, pp. 11–17, 1932.

After briefly describing chemical investigations into the nature of the exudate found in gummosis of fruit trees in Italy [cf. *R.A.M.*, x, p. 78] and expressing the opinion that the condition is diastatic and probably brought about by bacteria, the author cites the view of Delacroix that oxidation is necessary for gum formation and that of Ruhland that reducing bodies in the medullary rays may inhibit diastatic action. He concludes that the condition may perhaps be arrested by applying a powerful reducing liquid to the wound and preventing contact with the air. Laboratory tests indicated that control may possibly be effected as follows. The affected parts should be removed and the wound washed with a solution of ferrous sulphate, which acts as a disinfectant and a reducing agent, rendering the gummy fluids inoffensive and so permitting the wound to cicatrize completely. Finally, the wound should be painted over with tar.

YOSSIFOVITCH (M.). **Beiträge zur Kenntnis von Polystigma rubrum (Pers.) DC., des Erregers der Lohekrankheit der Zwetsche.** [Contributions to the knowledge of *Polystigma rubrum* (Pers.) DC., the causal organism of Damson scorch.]—*Nachricht. über Schädlingsbekämpf.*, vii, 2, pp. 41–49, 1932.

Damson scorch (*Polystigma rubrum*) [*R.A.M.*, viii, p. 17], a comparatively harmless disease in central and western Europe and the United States, is annually responsible for heavy losses, sometimes reaching epidemic proportions, as in 1928, in Serbia and Bulgaria. The infection period extends from March or early April, when the ascospores are formed, to about the middle of July. The fungus was shown by a series of spraying experiments to be readily controllable by one or more applications of Bordeaux mixture, nosprasit, or nosperit (1 or 2 per cent.), the critical time for the treatment being just at the end of the flowering period.

ROBERTS (J. W.) & PIERCE (L.). **Zinc-lime: a fungicide for the Peach.**—*Phytopath.*, xxii, 5, pp. 415–427, 1932.

Under experimental conditions and in commercial orchards in Indiana, the zinc sulphate-hydrated lime spray (4–3–50) has greatly reduced the incidence of infection by *Bacterium pruni* on

peach trees [*R.A.M.*, xi, p. 520]. Five to seven applications were found to be necessary owing to the occurrence of the disease throughout the spring and summer. The stomata being infection portals, special care must be taken to cover the under side of the leaves, and it is further advisable to reach the young twigs to prevent the formation of new bacterial spot cankers. Fairly severe infection by scab (*Cladosporium carpophilum*) and mild attacks of brown rot (*Sclerotinia fructicola*) [*S. americana*] were also controlled by zinc-lime in experiments on a small scale.

No injury was caused by the treatment, even at twice the strength here recommended; on the contrary, the leaves were often of a deeper green and larger than the controls, while there was some indication of a stimulus to fruit growth. Lead arsenate combined with zinc-lime caused less injury than in conjunction with sulphur fungicides and lime, or lime alone. A mixture of one of the wettable sulphurs commonly applied to peaches against scab and brown rot, and zinc-lime caused no injury to the trees and was reasonably effective in the control of *Bact. pruni*. Zinc-lime in dust form failed to control bacterial spot on the leaves and was less satisfactory than the spray on the fruit.

ZELLER (S. M.). **A Strawberry disease caused by Rhizoctonia.**—*Oregon Agric. Exper. Stat. Bull.* 295, 22 pp., 9 figs., 1932.

Rhizoctonia [*Corticium*] *solani* was the only one of several fungi isolated from the crown and root tissues of wilted strawberry plants in the Willamette and Hood River Valleys, Oregon, which was found to be capable of reproducing the symptoms of the disease in plants grown in sterile soil in pots [*R.A.M.*, x, p. 163]. It was also the only one consistently obtained from the characteristic, definite, black lesions on the roots. The disease has been reported from Washington, Michigan, and Utah, as well as Oregon. The symptoms are very similar to those of the *Leptosphaeria coniothyrium* and *Pezizella lythri* diseases recently described in Michigan [ibid., xi, p. 251], and confusion is liable to arise from the fact that all three have been termed 'black root disease'. Purpling of the veins occurs as well as wilting, and very slight infections may persist two or three years with merely a dwarfing effect on the plant. In the autumn marginal yellowing of the leaflets may be observed. Sometimes the leaves become erect, crisp, and gorged with starch, similar to those of potato plants affected by the same fungus.

In Oregon the *Rhizoctonia* disease is usually found in the residual hill soils of a reddish-brown clay loam at the foot of the Cascade Mountains, where cultural conditions are most favourable to the growth of the susceptible Marshall and Clark's Seedling varieties. Other susceptible varieties include Corvallis, Gold Dollar, Nick Ohmer, Improved Clark, and Magoon. The Ettersburg 121 and the wild coast strawberry (*Fragaria chiloensis*) are almost or quite immune. Infection has been observed on the field and wood strawberries (*F. cuneifolia* and *F. californica*), while the bracken fern, *Pteridium aquilinum* [var.] *pubescens*, a common native of the hill soils, is also frequently attacked by *C. solani*, which seems to be endemic in the region under discussion. The

most promising means of control seems to lie in the planting of vigorous stock of resistant varieties and in crop rotation.

STEVENS (N. E.). **United States of America: some diseases of small fruits.**—*Internat. Bull. of Plant Protect.*, vi, 5, pp. 73–74, 1932.

According to R. F. Poole, anthracnose [*Plectodiscella veneta*] of dewberries [*Rubus* sp.] was of minor importance in the Sandhill region of North Carolina from 1926 to 1929, inclusive [*R.A.M.*, x, p. 506]. In 1930 there was a definite increase of infection on the leaves and canes of the Lucretia variety, and in 1931 a large proportion of the crop was destroyed by the disease.

In 1931 the Massachusetts cranberry crop, comprising some three-quarters of that of the whole of the United States, showed an unusually high incidence of storage rots [ibid., xi, p. 188]. Test storage lots showed on 15th November 31, 14, and 30·5 per cent. rotten berries in the Early Black, Howes, and miscellaneous varieties, respectively, the corresponding figures for 1928, 1929, and 1930 being 7·4, 11, and 13·1 per cent. for Early Black, 6·5, 9, and 6·7 for Howes, and 12·2, 18, and 15·6 for miscellaneous varieties. The poor keeping quality of the crop in 1931 was apparently correlated with exceptionally high temperatures in May and June combined with an abnormally heavy rainfall in July and August.

STEVENS (F. L.) & CELINO (M. S.). **Papaya leaf spot.**—*Philipp. Agric.*, xxi, 1, pp. 9–14, 3 figs., 1 graph, 1932.

Papaw leaves in the Philippines often bear small, yellowish-brown, water soaked lesions, with a greyish centre at maturity, 8 mm. to 1 cm. in diameter, on both surfaces of which (especially the lower) a *Helminthosporium* develops profusely. The fungus is characterized by brown, erect, septate, simple, solitary conidiophores, up to 600 μ in length, bearing at their apices pale, 4- to 9-septate conidia, 17·2 to 123 by 11 to 21 μ, tapering towards the apex. Associated with the *Helminthosporium* on some of the spots (under 5 per cent.) are minute, dark brown, spherical bodies which are the perithecia of *Mycosphaerella caricae* Syd. [*R.A.M.*, v, p. 136].

The *Helminthosporium* was readily isolated on potato dextrose agar and other standard media and identified as *H. papayae* (*Ann. Mycol.*, xxi, p. 105, 1923), and reinoculated into papaw plants with positive results. It is thereby proved to be the cause of the leaf spot.

Sphaerella caricae Maubl. (*Bull. Soc. Myc. France*, xxix, p. 358, 1913) is regarded by Saccardo as synonymous with *M. caricae*, the only apparent difference between the two being the absence of constriction in the ascospores of the latter. The examination of local material, however, indicates that at maturity the ascospores become constricted. The association of *S. caricae* and *H. papayae* was thought by Maublanc to suggest genetic relationship, but though *S. caricae* and *M. caricae* [the Latin diagnoses of which are given] may be regarded as identical, the connexion between the latter and *H. papayae* is believed by the authors to be accidental.

Graham (J. J. T.). **Report on insecticides and fungicides.**—*Journ. Assoc. Official Agric. Chemists,* Washington, xv, 2, pp. 169–176, 1932.

The volatilization and precipitation methods for the determination of mercury in seed disinfectants designated I and II, respectively, and adopted as official (first action) in 1930 [*R.A.M.*, x, p. 807], were again tested collaboratively.

Three samples obtained from commercial sources were used for this work, No. 1 containing hydroxymercurichlorophenol sulphate, No. 2 ethyl-mercury-chloride, and No. 3 hydroxymercurichlorophenol. Sample 1 was entirely soluble, differing in this respect from 2 and 3, which contained large quantities of insoluble fillers. In sample 2 the filler was dark and was not whitened by the hydrogen peroxide, so that it was difficult to determine the point at which oxidation was completed. Both the methods were finally adopted officially for the determination of mercury in organic mercurial seed disinfectants, a note being appended to method II concerning the necessity of a sufficient quantity of peroxide to oxidize the organic matter.

Bubb's method of determining the lead and copper contents of Bordeaux-lead arsenate mixtures [loc. cit.] was tested on two samples, one a commercial product, and the other prepared by the referee and containing an unusually small amount of lime in proportion to copper, in addition to 14·37 per cent. sulphur trioxide. The results obtained by this method were not so consistent as those obtained by the official method (*Journ. Assoc. Official Agric. Chemists,* pp. 51–52, 1925), but certain modifications were made to overcome this difficulty and further tests will be conducted.

Delage (B.). **The solubility of copper in anticryptogamic products and its importance.**—*Chimie & Indus.* (Special Number), xxvii, pp. 853–858, March, 1932. (French.) [Abs. in *Chem. Abstracts,* xxvi, 13, pp. 3608–3609, 1932.

The solubility of the copper in Bordeaux mixture and similar products was studied by a modification of the Callan and Henderson method (*Chem. Abstracts,* xxiv, p. 312). It is stated that after the excess of soluble copper has been washed away by rain, the amount of copper dissolved is considerably less than the toxic dose for [vine] mildew [*Plasmopara viticola*], the destruction of which is apparently due to the accumulation of copper ions on the surface of the zoospores, where they may attain a concentration 100 to 1,000 times greater than in the solution.

Boutaric (A.), Doladilhe (M.), & Piettre (M.). **Sur l'emploi des matières colorantes comme agents anticryptogamiques, dans les maladies des végétaux.** [On the use of dyes as fungicidal agents in plant diseases.]—*Comptes rendus Acad. d'Agric. de France,* xviii, 24, pp. 819–824, 1932.

In connexion with a study of some of the dyes to which fungicidal properties are attributed, especially against vine mildew [*Plasmopara viticola*], e.g., Victoria blue, night blue, the yellow and orange derivatives of acridine, and auramine [see above, p. 622], all of which are colloidal with positive granules, the

authors observed that most of the adhesives used to reduce the superficial tension of these substances (brecolane, bile salts, oleate of soda, and the like) form colloids with negative granules in contact with the water of solution. The electro-positive colloid (dye) begins to flocculate as soon as the concentration of the electronegative colloid reaches a certain value (C^1), and this process persists up to a certain value (C^2) of the concentration of the negative colloid, whereupon it ceases completely. However, with a concentration of the negative colloid exceeding the value of C^2, the granules of the original colloidal solution are found to have become negative instead of positive.

When the granules of the dye become negative the substance is no longer capable of fixation on cellulose to any extent. Even with concentrations of the adhesive near C^2, at which flocculation is extremely slow, the fraction of the dye fixed is greatly reduced as compared with the same substance without an adhesive. Thus, the proportions of dye fixed when 0·5 gm. cellophane was introduced into solutions of 0·25 gm. per l. with brecolane were as follows: yellow and orange acridine 3 and 6 per cent., respectively, Victoria blue 0 per cent., and auramine 5 per cent., the corresponding figures for the dyes in a pure state being 80, 76, 84, and 85 per cent., respectively. Similar data were obtained in the case of the other adhesives, using cellophane and cotton as the cellulosic materials. It was further demonstrated that the mycelium of *Mucor mucedo* fixes the dyes strongly in the absence of an adhesive but not with an adhesive at a concentration above the indicated limits.

[A condensed version of this paper appears in *Rev. de Viticulture*, lxxvii, 1989, pp. 85–86, 1932].

PASTAC (I.). **Constitution of organic dyestuffs and their anticryptogamic action.**—*Chimie & Indus.* (Special Number), xxvii, pp. 851–861, March, 1932. (French.) [Abs. in *Chem. Abstracts*, xxvi, 13, p. 3608, 1932.]

The results obtained to date in the course of an extensive, but as yet incomplete, investigation on the fungicidal properties of dyes [e.g., to vine mildew (*Plasmopara viticola*): see preceding abstract] permit the formulation of the following general rules. The anticryptogamic action increases with the molecular weight to a maximum and then falls off sharply. Sulphonation almost entirely destroys the fungicidal properties, which are increased, on the other hand, by the substitution of an NR_2 for an NH_2 group. Certain fluorescent dyes are more active, especially *in vitro*, when exposed to sunlight, but some of these, notably phosphine acridine, exhibit their activity only in contact with leaves.

PLAUT (M.). **Über die Entwicklung von Beizverfahren, über Beizmittel und ihre Anwendung in Saatzuchtbetrieb.** [On the development of steeping methods, on fungicides and their application in the seed selection industry.]—*Zeitschr. für Züchtung*, A, xvii, 3, pp. 304–340, 19 figs., 1 diag., 3 graphs, 1932.

A comprehensive account, supplemented by 23 tables and numer-

ous bibliographical references, is given of the development, especially during the last 25 years in Germany, of the various methods of seed-grain and vegetable seed disinfection against parasitic diseases. Most of the recent work on which the survey is based has been noticed in this *Review*.

MORSTATT (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1931.** [Bibliography of plant protection literature for the year 1931.]—*Biol. Reichsanst. für Land- und Forstwirtsch.*, Berlin-Dahlem, 251 pp., 1932.

This bibliography of German and foreign literature published during 1931 on various aspects of phytopathology and plant protection has been compiled on the usual lines [cf. *R.A.M.*, x, p. 679].

DRAYTON (F. L.). **The sexual function of the microconidia in certain Discomycetes.**—*Mycologia*, xxiv, 3, pp. 345–348, 1932.

After a brief reference to the hypotheses expressed by former workers in regard to the nature and functions of microconidia in Discomycetes, the author states that he succeeded in inducing the formation of apothecia by *Sclerotium gladioli* [*R.A.M.*, vii, p. 724] by placing the microconidia from one thallus on certain structures (termed receptive bodies) developing on another thallus. In his experiments he used seven isolations of *S. gladioli*, namely, four from the garden gladiolus, one from a variety of the *Gladiolus nanus* type, one from crocus, and one from freesia. When monohyphal cultures of these isolations were grown on suitable media under proper moisture and temperature conditions [details of which are left for a further paper], they developed a discontinuous layer of sclerotized tissue with scattered sclerotia. From this crust there arose more or less columnar, brown or light brown receptive bodies, about 1 mm. high, covered with short protruding hyphae. When microconidia from the crocus strain were placed on the receptive bodies of any of the other six strains (a process which is named 'spermatization'), or microconidia of any of the latter on the receptive bodies of the former, these promptly developed into apothecial fundaments and, on exposure to light, expanded into mature apothecia, the whole process requiring from six to seven weeks from the initiation of the cultures. Receptive bodies which were subjected to the same conditions but not spermatized, proliferated to some extent but never developed into apothecia; the two groups represented by the crocus strain and the other six isolations were also self sterile. There was evidence that diploidization does not result from vegetative fusion, as indicated by the fact that no apothecia developed when the hyphae of the two thalli in paired cultures intermingled, even though receptive bodies were abundantly produced by the two thalli and these belonged to reciprocally interfertile strains. It is believed to be highly probable that this sexual mechanism exists, with perhaps slight modifications, in all the spermatia-producing Ascomycetes, including

in the term spermatia microconidia of the type of those in *S. gladioli*.

The apothecia produced in the experiments were typical of those found in *Sclerotinia*, and *Sclerotium gladioli* must therefore be placed in this genus. So far only the two sexual strains or races, one represented by the isolation from crocus, and the second by the remaining six isolations, have been found.

ROEMER (T.). **Immunitätszüchtung.** [Breeding for immunity.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, viii, 11, pp. 261–265, 2 diags., 1932.

Particulars are given of some hybridization experiments conducted at Halle in connexion with the scheme of breeding wheat varieties immune from *Puccinia glumarum* and *Ustilago tritici*, barley from *U. nuda*, and beans (*Phaseolus*) [*vulgaris*] from *Colletotrichum lindemuthianum*.

The yellow rust-susceptible Peragis summer wheat was crossed with the resistant Normandie variety with successful results, the ratio of resistant to susceptible plants in the F_3 generation being 6:10. The inheritance of resistance was obviously dependent on a single factor. A cross between Chinese 166, which is immune from *P. glumarum* but highly susceptible to cold, and the rust-susceptible but cold-resistant Strube's Dickkopf yielded strains combining the desirable qualities of both parents.

The Grüne Dame summer wheat variety is practically immune from loose smut, and this quality has been inherited by Peragis (a cross between Grüne Dame and Blaue Dame). However, a new physiologic form of *U. tritici* has now arisen on Peragis [*R.A.M.*, vii, p. 435] which attacks Grüne Dame to the extent of 86·61 per cent. while scarcely affecting Roter Schlanstedt. From crosses between Grüne Dame and (*a*) v. Rümker's Dickkopf, and (*b*) Roter Schlanstedt, new combinations have been produced combining resistance to the local strain of *U. tritici* as well as to that occurring on Peragis. Both are somewhat susceptible to the physiologic form Kleinwanzleben 368/20 (18 to 27 per cent. infection) but react differently to that from Turkey, the hybrid of Grüne Dame and Roter Schlanstedt (9493) being immune while the Grüne Dame and Dickkopf cross (9357–60) is susceptible. A physiologic form of *U. tritici* from the Argentine produced 52·5 and 31·6 per cent. infection on the latter in 1930 and 1931, respectively, the corresponding figures for the Grüne Dame and Roter Schlanstedt hybrid being 49.3 and 28·1, for the Grüne Dame parent 67·4 and 52·9 in 1930 and 1931, respectively, and for Roter Schlanstedt 84·6 and 59·7 per cent. in the two years. The new combinations yielded equally well with the prolific Roter Schlanstedt.

In Württemberg the inheritance of immunity from *U. nuda* was found to be dominant in crosses between the susceptible Heil's Franken barley variety and the resistant Walpersii, and a number of the new combinations further possessed the desirable qualities of early ripening, productivity, and resistance to lodging.

The work by Schreiber on the development of beans resistant to *C. lindemuthianum* has been noticed from another source [see above, p. 618].

Müller (K. O.). **Über die Erzeugung krankheitsresistenter Pflanzenrassen.** [On the production of disease-resistant plant strains.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, viii, 11, pp. 265–271, 1932.

A general survey of the underlying principles, the achievements hitherto obtained, and the future prospects of breeding cultivated plants for freedom from disease is followed by an account of recent work among various crops, with special reference to the development of strains of potato resistant to *Phytophthora* [*infestans*: *R.A.M.*, x, p. 545].

McKay (M. B.) & Dykstra (T. P.). **Potato virus diseases: Oregon investigations 1924–1929.**—*Oregon Agric. Exper. Stat. Bull.* 294, 40 pp., 17 figs., 1932.

A full account is given of the results obtained during six years' field and greenhouse studies (1924–29) at the Oregon Agricultural Experiment Station with a number of different virus diseases maintained on several potato varieties.

The chief symptoms and differential characters are described for the mild, interveinal, crinkle, rugose, and leaf-rolling mosaics, leaf roll, spindle tuber, calico [*R.A.M.*, xi, p. 320], giant hill, and witches' broom [cf. ibid., xi, p. 595]. The leaf mutilation method was found to be effective in the transmission of mild, crinkle, rugose, and leaf-rolling mosaic, calico, and spindle tuber, but not leaf roll, while the same four mosaics, leaf roll, and spindle tuber, but not calico, were transmitted by the core-graft method [ibid., v, p. 442; x, p. 263]. Crinkle, rugose, and leaf-rolling mosaic and leaf roll, but not mild mosaic, were transmitted by *Myzus persicae*. *Illinoia solanifolii* [*Macrosiphum gei*] transmitted leaf-rolling mosaic and leaf roll, but was less efficient with the latter than the other aphids. It did not transmit mild, crinkle, or rugose mosaic. *Myzus* [*Macrosiphum*] *pelargonii* transmitted leaf-rolling mosaic and leaf roll [ibid., x, p. 163] but not mild, crinkle, or rugose mosaic, while *M. circumflexus* conveyed crinkle and rugose mosaic and leaf roll, but not mild mosaic. Rugose mosaic passed from diseased to healthy plants under insect-proof field cages in the apparent absence of any kind of insects on the aerial organs. Mild mosaic (to which the Irish Cobbler variety appears to be resistant), interveinal mosaic, and leaf roll were not transmitted in this way. Giant hill seems to pass from diseased to healthy plants when the roots are disturbed by deep cultivation.

Tests showed reductions in yield amounting to 73 per cent. by weight in the case of spindle tuber, and 50 and 19 per cent., respectively, for crinkle and interveinal mosaics.

The roguing of seed plots by the tuber-unit method was found to be more satisfactory for the elimination of virus diseases than the mass roguing method. The tuber-indexing method [ibid., x, p. 681] was most effective for the eradication of virus infections from seed stocks but is considered impracticable for general farm use. Hill-indexing failed to give reliable control [ibid., iii, pp. 297, 549].

Esmarch (F.). **Die Blattrollkrankheit der Kartoffel.** [The leaf roll disease of the Potato.]—*Monographien zum Pflanzenschutz*, 8, 91 pp., 6 figs., Berlin, J. Springer, 1932.

This monograph on potato leaf roll is divided into the following sections: introduction (history, geographical distribution, and economic importance); histology; physiology, including carbohydrate and albumin metabolism, respiration, and transpiration; transmission, natural (by tubers, seed, soil, insects, contact, and weeds) and artificial; influence of external factors (climate and weather, soil and site, manuring and cultivation); internal factors governing reaction to the disease, viz., variety, stage of development, and maturity, storage, and germination of seed potatoes; etiology (virus and physiological theories); and control.

Discussing the etiology of the disease, the writer inclines to the view that the causal virus is a living entity rather than an enzymatic or toxic substance [cf. *R.A.M.*, vii, p. 341 *et passim*]. Against so much positive evidence in favour of the virus theory, the physiological hypotheses of Merkenschlager [ibid., xi, p. 395], Schweizer [ibid., x, p. 332], and Schander [ibid., vi, p. 686; vii, p. 460] can scarcely be maintained on their present negative basis. A possible explanation of the divergent views, as regards Germany, is the occurrence of the disease in two forms, one of which is transmissible by insects while the other, possibly of ecological origin, cannot be disseminated by this means. This interpretation of the leaf roll problem is discussed by Laske (Vortrag i. d. zool.-bot. Sektion Schles. Ges. f. vaterländ. Kultur, 1929. Manuscript).

Forty-fifth Annual Report of the Agricultural Experiment Station of Nebraska for the year ending June 30, 1931.—52 pp., 1932.

The following items of interest occur in the section of this report on plant diseases (pp. 31–34) by G. L. Peltier and his collaborators. The incidence of potato scab [*Actinomyces scabies*: *R.A.M.*, ix, p. 403] appears to depend more on environmental conditions than on inherited or tuber-line differences. Time of planting was a most important factor in scab development, early strains planted late giving better results than late ones planted early.

A further study of seed potato production in eastern and central Nebraska confirmed previous results showing that good seed stock can be raised from virus-free seed [ibid., ix, p. 51]. Triumph tubers are highly susceptible to cracking during harvesting; the fissures are very deep and serve to admit rot-producing organisms. Experiments showed that cracking is most prevalent on large, immature, turgid tubers, especially when dropped on the edge. Tubers exposed to the air for a few hours developed great resistance to cracking, which was further prevented by a coating of dirt on the digger rods and the padding of picking baskets.

Jørstad (I.) & Lunden (A. P.). **Investigations on the inheritance of immunity to wart disease (Synchytrium endobioticum [Schilb.] Perc.) in the Potato.**—Reprinted from *Meld. Norges Landbrukshøiskole, 1932,* 19 pp., 1 fig., 1932. [Norwegian summary.]

The results [which are fully discussed and tabulated] of green-

house tests and field experiments conducted from 1928 to 1931 at the Botanical Museum, Tøien, Oslo, on the inheritance of immunity from wart disease (*Synchytrium endobioticum*) in the potato [*R.A.M.*, x, p. 204; xi, p. 321] showed that susceptible varieties, e.g., Centifolia, Sagerud, Marius, and Early Puritan, when self-fertilized or crossed with another susceptible variety, yielded only susceptible progeny. The immune varieties Hindenburg, Pepo, Flourball, Tannenberg, Seydlitz, and Richter's Jubel segregate by self-fertilization in an approximate 3:1 ratio of immunes and susceptibles, and might therefore all be considered heterozygous for a single factor (X) determining the mode of reaction to wart disease, immunity being dominant to susceptibility. The immunity factor may or may not be identical in the different varieties. Susceptibility must therefore be recessive to immunity, as already shown by Salaman and Lesley [ibid., iii, p. 170], contrary to the views of Collins (*Gard. Chron.*, lxx, pp. 260, 271, 290, 314, 326, 1921).

Crossing of immune and susceptible varieties gave divergent results. In some crosses segregation occurs in a 1:1 ratio of immunes to susceptibles, as would be expected from the above data, showing that immunity is dependent on a single, segregating factor in the immune parent. One cross between an immune and a susceptible variety (Golden Lass × Centifolia) segregates in an approximate 3:5 ratio of immunes and susceptibles, immunity probably depending on two complementary factors Y and Z, for both of which Golden Lass is heterozygous while Centifolia is heterozygous for one and recessive for the other (Yy Zz × Yy zz). In other immune × susceptible crosses, with Richter's Jubel as the immune parent, segregation takes place in a ratio of approximately 5 immune : 3 susceptible plants, indicating that the variety in question carries, in addition to the immunity factor X, the factor Z in a heterozygous condition, while the other parent (Early Puritan, Louis Botha, or Sagerud) contains the complementary factor Y, also heterozygous (xx Yy zz × Xx yy Zz). The complementary factors Y and Z appear to be independent of X in producing immunity and X to be independent of Y and Z.

Different results were given by crossing the two immune varieties Edzell Blue and Kerr's Pink with Richter's Jubel, the approximate ratios of diseased to healthy plants being 1:7 and 1:15, respectively. These results are explicable on the basis that Edzell Blue is of the genotype Xx YY zz, Kerr's Pink Xx X′x YY zz and Richter's Jubel Xx x′x′ yy Zz, the immunity factors X and X′ being apparently independent of each other and of Y and Z.

Jørstad (I.). **Beretning om plantesykdommer i land- og hagebruket. VII. Sopp- og bakteriesykdommer på Poteter.** [Report on plant diseases in agriculture and horticulture. VII. Fungous and bacterial diseases of Potatoes.]—Reprinted from *Landbruksdirektørens Beretning*, *Tillegg C*, 63 pp., 4 figs., 1932.

Notes are given on the following potato diseases occurring in Norway from 1924 to 1931: late blight (*Phytophthora infestans*), dry rot (*Fusarium coeruleum* and other species), sclerotial disease

(*Sclerotinia sclerotiorum*) [*R.A.M.*, vii, p. 8], grey rot (*Botrytis cinerea*), verticilliosis (*Verticillium albo-atrum*), black scurf (*Corticium vagum*) [*C. solani*], powdery scab (*Spongospora subterranea*), flat scab (*Actinomyces scabies* and other species), skin spot (*Oospora pustulans*), silver scurf (*Spondylocladium atrovirens*), ring bacteriosis (*Bacterium sepedonicum*) [ibid., viii, pp. 288, 458], bacterial stalk rot (*Bacillus carotovorus*) [ibid., x, p. 125], also mainly responsible for a soft rot of stored tubers, and 'internal rust spot' [see next abstract].

GHIRENKO (V. N.). К вопросу о влиянии реакции и влажности почвы на развитие железистой пятнистости в клубнях Картофеля. [Note on the problem of the influence of soil reaction and moisture on the development of internal rust spot in Potato tubers.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 65–72, 1 fig., 1932. [English summary.]

Internal rust spot of potatoes [*R.A.M.*, x, p. 746] is stated to be very prevalent in light, sandy soils in the region of Novozybkoff, western Russia. Experiments carried out in 1930, in which potato tubers affected with the disease were grown in a series of containers with soil, the reaction of which was adjusted to P_H values ranging from 4·31 to 7·7, showed that plants grown in soil of P_H values up to 5·79 remained healthy, while at the higher P_H values the incidence and severity of the disease increased together with this value and attained their maximum at the top of the scale. Tests in 1929 and 1930 showed that soil moisture has no apparent bearing on the development of internal rust spot.

[NATTRASS (R. M.).] **Late blight of Potatoes.**—*Cyprus Agric. Journ.*, xxvii, 2, pp. 65–68, 2 figs., 1932.

Popular notes are given on late blight of potatoes (*Phytophthora infestans*), which was reported for the first time in Cyprus during 1931, when a slight outbreak occurred in the Famagusta district. Immediate steps were taken to restrict the disease to the affected area, with the result that the autumn crop appeared to be quite healthy. Early blight (*Alternaria solani*) also occurs in the island but is of minor importance.

LUNDEN (A. P.). **Versuche mit neuen immunen Kartoffelsorten im Versuchsgut Vollebekk in Aas.** [Experiments with new immune Potato varieties at the experimental farm Vollebekk in Aas.]—*Meld. Norges Landbrukshøjskole*, xi, p. 193, 1931. (Norwegian.) [Abs. in *Fortschr. der Landw.*, vii, 14, p. 376, 1932.]

Comparative tests carried out from 1928 to 1930 with 34 potato varieties, including 20 English and 11 German, showed that under local Norwegian conditions, the late maturing Hellena, Beseler, and Arran Consul are the most resistant to *Phytophthora* [*infestans*: cf. *R.A.M.*, vii, p. 595].

BARRUS (M. F.). **Seed treatment of Potatoes in New York State.**—*Amer. Potato Journ.*, ix, 5, pp. 73–75, 1932.

During 1931 the number of bushels of seed potatoes treated by

1,380 farmers in 11 counties of New York State by the hot mercuric chloride dip amounted to 133,568, the average cost of the treatment, which was used against *Rhizoctonia* [*Corticium solani*] and scab [*Actinomyces scabies*], being 4·01 to 7 cents per bushel. The use of mercury compounds for fungicidal purposes is stated to be increasing yearly, partly as a result of the researches of F. M. Blodgett on calomel and the slightly more soluble yellow oxide of mercury [*R.A.M.*, vii, p. 666]. In 1931 1,589 farmers used cold mercuric chloride compared with 657 in 1930; 2 and 40 used hot and cold formaldehyde, respectively; and 642, 192, and 1,242 employed yellow oxide of mercury, calomel, and semesan bel, respectively, as against 57, 278, and 683 in 1930. The total number of bushels treated in New York State in 1931 (including the hot mercuric chloride estimates) was 408,926, compared with 208,905 in 1930.

Walker (O. F.). **Testing the strength of corrosive sublimate in the treating of seed Potatoes.**—*Amer. Potato Journ.*, ix, 5, pp. 75–77, 1 diag., 1932.

Directions are given for testing the strength of the mercuric chloride solutions used for treating potatoes [against *Corticium solani* and *Actinomyces scabies*: see preceding abstract] by means of potassium iodide. After a batch of potatoes has been treated in the stock solution (4 oz. mercuric chloride in 30 galls. water) sufficient of the solution is added to a test solution (containing 5 gm. potassium iodide and a very little copper sulphate in 1,000 c.c. of water) to produce a uniform red cloudiness. A specially graduated measuring glass is used for the purpose. According to the quantity of the solution required to do this a corresponding amount of concentrated mercuric chloride solution (2 oz. in 1 qt.) is added to the contents of the treating tank. This method has been found to save both time and money, a batch of potatoes being treated in 35 minutes without emptying the tank, and about $3 worth less mercuric chloride per 250 bushels being required.

Güssow (H. T.) & Foster (W. R.). **A new species of Phomopsis.**—*Canadian Journ. of Res.*, vi, 3, pp. 253–254, 2 pl., 5 figs., 1932.

English and Latin diagnoses are given of a fungus independently isolated by both writers in the autumn of 1930 from the lesions of a characteristic hard stem-end rot of potatoes from Vancouver, British Columbia. The organism, which is named *Phomopsis tuberivora* Güssow & Foster sp. n., is characterized by dothideoid, sessile, cushion-shaped to variable, sclerotioid, coal-black, single or occasionally confluent, indistinctly papillate pycnidia, 0·25 to 0·50 by 1 to 2 mm., at first innate in a stroma, later erumpent; hyaline, unicellular, fusiform, guttulate conidia, minimum, modal, and maximum lengths, 7·11, 11·85, and 13·03 μ, respectively, width 4 to 6 μ, borne on persistent, subulate, simple conidiophores, 15 to 18 by 1·5 μ, septate at the base. Stylospores or B spores [*R.A.M.*, x, p. 279] were only found twice, once on a diseased tuber and once in a culture on cooked barley seed; they were filiform, curved or straight, and measured 8 to 30 by 0·5 to 1·5 μ.

REDDICK (D.). **Some diseases of wild Potatoes in Mexico.**—*Phytopath.*, xxii, 6, pp. 609–612, 1932.

This is an expanded account of the writer's observations on the diseases of wild potatoes in Mexico, a preliminary note on which has already been published [*R.A.M.*, xi, p. 397]. The 'spot' disease of *Solanum demissum* is characterized by lesions resembling those due to *Alternaria solani*, except for the absence of target lines. One leaf may bear a good many spots, the tissue between which turns yellow and the whole leaf dies, though usually remaining attached to the stem. At this stage the plant exhibits all the symptoms of late blight (*Phytophthora infestans*) but no trace of that organism could be detected. Shoots arising from long stolons in the same pots as heavily infected parent plants may be entirely free from the disease, which for the time being must be regarded as of physiological origin. A similar condition has previously been observed on *S. demissum* in the greenhouse at Ithaca, New York.

The collection of *Puccinia pittieriana* on *S. demissum* extends the range of this rust considerably. Blight (*Phytophthora infestans*) does not seem to have been previously reported from Mexico on wild plants. It was only seen on *S. antipoviczii*.

SHARPLES (A.). **Annual Report Pathological Division.**—*Ann. Rept. Rubber Res. Inst. Malaya, 1931*, pp. 76–87, 1932.

Investigations by R. P. N. Napper on the root disease of *Hevea* rubber caused by *Fomes lignosus* [*R.A.M.*, xi, p. 400] have clearly shown the necessity for further experiments on this problem covering a wider field. Up to the age of three years, trees are exposed to a greater risk of infection by this fungus in an area cleared of surface timber and jungle stumps than in an uncleared one. Up to the same age the incidence of infection is probably lowest where secondary jungle has been allowed to grow up as a natural cover. The growth of *F. lignosus* is promoted by applications of lime.

Sphaerostilbe repens and *Ustulina zonata* were common on rubber roots [ibid., x, p. 160], mixed attacks by the two fungi being also observed on several occasions.

DOPHEIDE (A. B. A.). **Drie meeldauw-campagnes.** [Three mildew campaigns.]—*De Bergcultures*, vi, 26, pp. 653–655, 1932.

Details are given of three campaigns against *Hevea* rubber mildew [*Oidium heveae*] conducted on the Proempang estate, Java, during the seasons of 1929, 1930, and 1931 [*R.A.M.*, x, pp. 56, 205; xi, p. 470]. In the first year five dustings with sulphur with the Björklund apparatus reduced the number of trees suffering total defoliation from 15 to 1 per cent., while the number of those with entirely healthy leaves was increased from 3 to 44 per cent. The total cost of the treatment (excluding cost of the machine) worked out at Fl. 5·48 per bouw [= 0·71 hect.]. In 1930 80 per cent. of the dusted trees remained free from infection, 19 per cent. were very mildly attacked, and only 1 per cent. showed slight defoliation. The costs were considerably lower than in 1929 (Fl. 3·90 per bouw). The results of the third campaign in 1931 were

even more satisfactory, 90 per cent. of the treated trees being entirely free from mildew, while the remainder showed slight spotting with a negligible amount of defoliation. The costs were still further reduced, amounting only to Fl. 2·28 per bouw, divided as follows: 15·14 kg. of sulphur Fl. 1·89, wages 0·20, benzine and oil 0·18, and miscellaneous 0·01. The number of treatments and the quantity of sulphur required for the treatment of a given area was found to vary considerably in different parts of the same plantation, the minimum quantity of sulphur used per round being 3 kg. per bouw and the maximum 8 kg., while the total ranged from 8·99 to 20·96 kg. per bouw, in the 1931 campaign.

PASSALACQUA (T.). **Marciume apicale secco del 'Capsicum annuum' L. prodotto dal Bacillus coli-capsici n. var.** [Apical dry rot of *Capsicum annuum* L. caused by *Bacillus coli-capsici* n. var.] —*Riv. Pat. Veg.*, xxii, 3–4, pp. 59–62, 1932.

In the summer of 1931, chilli pepper (*Capsicum annuum*) growing in the vicinity of Palermo developed a dry rot of the apical part of the fruits, characterized by a somewhat extensive darkening and thinning of the tissues, which were invaded by common saprophytes. The affected fruits were rather deformed, as a result of their irregular growth. The attack began on ripening fruits as a small yellow spot at the upper extremity, where the tissues were softened and contained bacteria. The disease was present in all the gardens visited, being most severe on the so-called Naples variety, recently introduced. Apparently it had been present for some years, but had not been serious enough to attract attention.

From recently affected fruits, the author isolated a motile, monotrichous, asporogenous, Gram-negative bacillus measuring 0·75 to 1 by 0·25 μ, the physiological and morphological characters of which lead him to refer it to the *coli-simili* group; he names the organism *Bacillus coli-capsici* n. var. Inoculations of healthy pepper and tomato plants gave positive results.

DE HAAN (J. T.) & PEELEN (J. R. C.). **Palavruchtschimmel.** [The Nutmeg fungus.]—*De Bergcultures*, vi, 23, pp. 584–594, 3 graphs, 1932.

After briefly summarizing Steinmann's investigations in Java on the nutmeg fungus (*Coryneum*) [*myristicae*: *R.A.M.*, x, p. 209], the first-named writer discusses the replies to a *questionnaire* circulated to seven planters.

Five out of the seven stated that the disease had been serious of recent years. The two plantations on which little damage occurred are situated at a distance from any others, and in one of these cases freedom from infection was also attributed to the regular practice of collecting and burying the shells. The high relative humidity of the air, especially in the early months of the year, was considered by one planter to be a factor in the causation of the disease. The losses on the plantations in question were very variable, ranging from 2 to 75 per cent. of the crop, or 94 per cent. counting the nuts of inferior quality. On one estate where severe losses occurred, it was estimated that only 1·3 per cent. of the nuts

from ten trees gathered during a 14-day period were of prime quality.

It would appear from information elicited by the second-named writer at the Central Java Experiment Station that the age of the trees has no effect on the course of the disease. Infection is heavier and the quality of the nuts inferior when the west monsoon sets in early, with a high monthly mean precipitation during the second part of the year. Beneficial results have consistently followed the collection and burying of the shells.

MARTIN (J. P.). **Pathology.**—*Proc. Hawaiian Sugar Planters' Assoc., Fifty-first Ann. Meeting, 1931*, pp. 605–618, 1 pl., 1 fig., 1 map, 1932.

In addition to the information given in previous notices on chlorotic streak disease of sugar-cane in Hawaii [*R.A.M.*, xi, pp. 4, 540], it is here stated that none of the bacteria isolated from such plants and inoculated into healthy ones gave conclusive results. Control should be based on the selection of healthy material for planting, roguing diseased plants as they are found in the field, and hot water treatment of setts.

Notes are also given on eye spot [*Helminthosporium ocellum*], pokkah-boeng [*Gibberella moniliformis*: ibid., xi, p. 4], red stripe [*Phytomonas rubrilineans*: ibid., xi, p. 542], and other diseases observed during the year. A map shows the distribution of the major sugar-cane diseases in different parts of the world.

MARTIN (J. P.). **Seed borne diseases of Sugar Cane.**—*Proc. Fourth Congr. Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 7, p. 300, 1932.]

In view of the frequent shipment of propagating material in the form of cuttings and 'fuzz' (cane seed) between different cane-growing districts and countries, all information concerning diseases that may be disseminated in this way is considered to be of vital importance. There is as yet no record of the dissemination of infection by means of true cane seed, but a special investigation on the subject is considered desirable.

COOK (M. T.). **Parasitism of Marasmius sacchari Wakker.**—*Proc. Fourth Congr. Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 7, p. 300, 1932.]

The pathogenicity of *Marasmius sacchari* on sugar-cane [*R.A.M.*, iv, pp. 259, 313; vi, pp. 79, 80] having been questioned by some investigators, the writer made a study of this fungus [in Porto Rico], where it was found to attack and often destroy the leaves, stems, and roots of young plants.

TAI (F. L.). **Collections of fungi in China by foreign explorers.**—*Nanking Journ.*, i, pp. 537–548, 1932.

Notes, together with lists of the new species recorded, are given of the fungus collections made in China by Delavay (1881 and 1893), Komarov (1896), Miyake (1908–12), Reinking (1919), Miura (1918–30, 64 species), Hara (1926), and Skvortzow (1925 and 1927). Handel-Mazzetti collected in south-western China from

1914–18, but his list has not yet been published. From 1923–26 R. H. Porter made collections of fungi in various parts of eastern China, a preliminary note on which has appeared [*R.A.M.*, v, p. 656].

URRÍES Y AZARA (M. J. de). **Datos sobre micromicetos de la provincia de Huesca.** [Data on micromycetes of the province of Huesca.]—*Bol. Soc. Española Hist. Nat.*, xxxii, 4, pp. 213–229, 5 figs., 1932.

A list, accompanied by taxonomic annotations and Latin diagnoses of the new species, is given of 67 species of fungi collected by the writer since 1930 in Huesca. Nine species and three forms are described as new, while eleven genera are recorded for the first time in Spain. *Monopus caballeroi* n. sp., found on living leaves of *Salvia officinalis*, is characterized by amphigenous, globose, black perithecia, usually occurring in groups of three, 90 to 100 μ in breadth, furnished with 'feet' or cylindrico-conical stromatic masses 30 μ in length, from which hyphae radiate into the mesophyll of the leaf; and cylindrical to clavate, sessile asci, 40 to 50 by 7·5 to 9 μ, containing eight distichous, ellipsoid, hyaline, uniseptate ascospores. This is believed to be only the second species of *Monopus* hitherto recorded.

Cytosporina manninoi n. sp., occurring on living branches of *Quercus ilex*, forms numerous scattered, verruciform, erumpent, lobulate stromata, containing large divided locules; hyaline, cylindrical, simple basidia, 11 to 17 by 4 μ; and hyaline, allantoid, curved spores with rounded ends, 40 to 50 by 5 to 6 μ.

Hendersonia crastophila was found on leaves of *Sorghum halepense* [*Andropogon halepensis*], and living box (*Buxus sempervirens*) leaves were attacked by *Macrophoma candollei* (Berk. & Br.) f. *ramosa* n. f., which is characterized by cylindrical, hyaline, straight or slightly curved spores, 27 to 35 by 5 to 8 μ, and variable hyaline basidia, either short and simple or more often long and profusely branched, 6 to 35 by 4·2 μ.

JØRSTAD (I.). **Notes on Uredineae.**—*Nyt Magazin for Naturvidenskaberne*, B. lxx, pp. 325–408, 17 figs., 1932.

This is an annotated account of 186 Norwegian rusts, to which a six-page bibliography is appended.

SPARROW (F. K.). **Observations on the aquatic fungi of Cold Spring Harbour.**—*Mycologia*, xxiv, 3, pp. 268–303, 2 pl., 4 figs., 1932.

In this paper the author describes 40 aquatic species of Phycomycetes which were found at Cold Spring Harbour, Long Island, New York; four are believed to be new to science, and fifteen appear to be reported for the first time from the United States. Latin diagnoses of the new species are appended.

BOSBERGER (J. C. A.). **De 'Thee-schimmel' (djamoe dipa) een gevaar voor onzen Thee-aanplant?** [Is the 'tea fungus' (djamoe dipa) a danger for our Tea cultivation?]—*De Bergcultures*, vi, 23, p. 577, 1932.

In connexion with a recent article describing the cultivation of

the 'tea fungus' [*Bacterium xylinum* and *Saccharomycodes ludwigii*] in Java [*R.A.M.*, xi, p. 548], the writer states that a number of planters deprecate the extension of these organisms on account of the supposed risk to the tea plantations and the fermenting processes in the factories. They will not, therefore, associate themselves with the propaganda for the cultivation of the 'fungus' among the native population unless they are officially notified by the phytopathological authorities that such fears are groundless.

STOREY (H. H.). **Leaf curl of Tobacco in Southern Rhodesia.**—*Rhodesia Agric. Journ.*, xxix, 3, pp. 186–192, 1932.

The writer's comparative observations in East Africa and Southern Rhodesia clearly indicate that the tobacco disease known in the latter province as 'leaf curl', 'crinkling', or 'frenching', is identical with that designated as 'crinkly dwarf' in South Africa, 'cabbaging' in Nyasaland, and 'kroepoek' in Java [*R.A.M.*, xi, p. 478]. 'Leaf curl' being the accepted name for the analogous disease in cotton, this term will in future be employed for the disorder of tobacco in Amani and Rhodesia. The whitefly (Aleyrodidae), *Bemisia* (?) *gossypiperda* [cf. ibid., xi, p. 76], responsible for the transmission of the disease at Amani, is probably also the agent of dissemination in Rhodesia, but investigations in collaboration with J. C. F. Hopkins are in progress to prove this point. Entomologists are apparently agreed as to the impracticability of controlling the insect in the field, and it is therefore most important to remove the source of the virus. In Amani this is a weed, *Vernonia* sp. (Compositae), from which leaf curl has been experimentally transferred to tobacco by whiteflies bred on healthy bean plants. No alternate host of the virus has yet been found in Southern Rhodesia, but it is certain that the infective principle is carried over the winter in surviving tobacco plants in the previous season's fields. The destruction of all such material is, therefore, essential to the control of leaf curl, while the breeding of resistant varieties should also be considered as a safeguard against future serious outbreaks.

In the writer's opinion the enations (including the simple greening of the veins) are the primary diagnostic feature of the disease under discussion, inasmuch as they constitute an unusual type of abnormality, while leaf curl may arise from a number of causes. It is mainly on this basis that the disturbance observed on the Orinoco White Stem variety in Rhodesia is identified with the Amani disease. The leaf curl symptoms, moreover, are extremely variable, sometimes consisting merely in a mild curling; greening of the veins is also sometimes absent.

Leaf curl has been produced by feeding the whitefly, collected on diseased tobacco plants, on healthy seedlings, but not by means of insects bred on healthy bean plants. It is necessary to cage considerable numbers of the whitefly in lamp glasses covering the entire plants. The symptoms experimentally induced include a transitory clearing of the veins of young leaves, a mild curling typical of the variety at Amani, the greening of some of the veins, and a stunting of the plants.

BENINCASA (M.). **Una malattia dei semenzi di Tabacco.** [A seedling Tobacco disease.]—*Ist. Sper. per la Tabacchicoltura Salentina*, Lecce, 1931. [Abs. in *Riv. Pat. Veg.*, xxii, 1–2, p. 41, 1932.]

In 1931 considerable damage was caused to Levantine tobacco seedlings growing in south-eastern Italy by an attack attributed to *Bacterium pseudozoogloeae* [*R.A.M.*, vi, p. 444; x, p. 62]. The disease [the symptoms of which are indicated] makes its appearance during cold, damp weather in March and April; the local growers resort to Bordeaux mixture for control purposes.

NOLLA (J. A. B.). **Las enfermedades del Tabaco en Puerto Rico.** [Tobacco diseases in Porto Rico.]—*Puerto Rico Dept. Agric. y Com., Estac. Insul. Bol.* 39, 29 pp., 6 figs., 1 diag., 1932.

Notes are given on the symptoms, causes, and control of a number of diseases affecting the Porto Rican tobacco crop, of which the most important are damping-off of seedlings (*Pythium de Baryanum* and *Phytophthora nicotianae*) [*R.A.M.*, x, p. 777], the latter being responsible also for black shank; root rot (*Thielaviopsis basicola*) [ibid., x, p. 346] on the yellow Consolación variety in the Río Plata Valley; mosaic [ibid., x, p. 412]; and leaf spot (*Cercospora nicotianae*) [ibid., vi, p. 602 and next abstract]. Instructions are given for the preparation of Bordeaux mixture (4–4–50), the application of which is generally effective against the fungous diseases enumerated above.

HOPKINS (J. C. F.). **Mycological notes. Seasonal notes on Tobacco diseases. 3. Frog eye. 4. White mould.**—*Rhodesia Agric. Journ.*, xxix, 3 pp. 202–204, 1932.

Popular notes are given on the occurrence and control in Southern Rhodesia of the tobacco diseases known as frog eye [*Cercospora nicotianae*: *R.A.M.*, ix, p. 140] and white mould [*Erysiphe cichoracearum*: ibid., x, p. 585]. The former appears to be increasing in prevalence and is liable to cause heavy losses especially in the form which becomes manifest in the curing barns; two years ago it was held responsible by a big buyer for putting a large proportion of the season's crop in the 'perished' grades. A determined effort to eradicate this disease is necessary to avoid serious damage.

OLITSKY (P. K.) & FORSBECK (F. C.). **The inactivation of mosaic disease virus by pulverizing infected tissue.**—*Science*, N.S., lxxv, 1950, pp. 518–519, 1932.

Details are given of the writers' experiments on the inactivation of the tomato mosaic virus [*R.A.M.*, xi, p. 257].

No appreciable loss of virus potency was caused in the top leaves of several hundred diseased plants by drying and grinding for five minutes with pestle and mortar. Partial or complete inactivation was effected, however, by placing measured amounts of the pulverized tissue with four polished steel balls, 1·1 cm. in diameter, in Pyrex bottles which were subjected to active agitation in a shaking machine.

In one of two typical experiments it was found that complete

inactivation was produced by 4, 6, or 12 hours' pulverization, while in the other, 8 and 2 out of 18 tomato plants became infected on inoculation with material pulverized for 6 and 12 hours, respectively. Inactivation of the virus took place more rapidly under anaerobic than under aerobic conditions. For instance, in two typical tests, 30 out of 32 plants inoculated with material before comminution were positive and 20 out of 32 injected with virus pulverized for 12 hours showed mosaic, whereas none of the 29 plants developed infection after inoculation with material subjected to anaerobic pulverization for 12 hours.

In three adsorption tests virus powder was mixed with normal plant powder pulverized for 4 and $10\frac{1}{2}$ hours, respectively. This mixture was either shaken for three hours and its aqueous suspension immediately filtered, or it was allowed to stand as a suspension for two hours before filtration. Furthermore, the relative amount of virus filterable from suspensions of large and small particles (obtained by winnowing through a glass tube) was determined. In these tests 190 plants were inoculated by McKinney's method [ibid., vii, p. 45], usually with a series of tenfold dilutions beginning at 1 per cent. All filtrations were made through Berkefeld 'N' candles.

In the three adsorption tests, 75 per cent. of 104 plants were positive after inoculation with comminuted virus mixed with finely pulverized normal plant tissue, as compared with 77 per cent. of 86 control plants inoculated with virus powder alone. In the winnowing experiment with particles of three degrees of magnitude, no differences in virus potency were detected, so that there is evidently no special tendency of the smaller particles to adsorb virus. Adsorption, if it occurs, is therefore probably not the main cause of the inactivation.

BEWLEY (W. F.). **The nature of the virus principle in mosaic disease.**—*Seventeenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1931*, pp. 45–46, 1932.

Evidence previously obtained in connexion with a study of tomato mosaic suggested that the virus might be of the bacteriophage type [*R.A.M.*, x, p. 536]. During the latter part of March and early April, 1931, fresh samples of juice were prepared from plants infected with aucuba mosaic and also from healthy plants, filtered through L 3 filters, and added to five-day potato-broth cultures of the bacterial organism originally isolated from a diseased stem [loc. cit.]. In the case of the infected juice there was distinct clearing of the cultures in 18 hours, which became more marked in 24, while after 72 hours turbidity began to redevelop. No clearing action could be obtained with samples of aucuba, mild mosaic, and stripe disease juice prepared in late April and May.

READ (W. H.). **Physiological investigations of mosaic disease of the Tomato.**—*Seventeenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1931*, p. 44, 1932.

Preliminary investigations on the effect of aucuba mosaic on the composition of the tomato plant [*R.A.M.*, x, p. 135] indicated

that inoculation with this virus first results in an increase of both total and reducing sugars as compared with the controls. The increase began about eight days after inoculation and reached a maximum about the twelfth day, when it amounted to approximately 100 per cent. over the controls. Some twenty days after inoculation the sugar content of the plants began to fall slightly.

BOLAS (B. D.). **Physiological investigations of mosaic disease.**—*Seventeenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1931*, p. 47, 1932.

Previous studies indicated that the progress and severity of both ordinary and aucuba mosaic in the tomato plant [see preceding abstracts] is frequently connected with carbohydrate metabolism. Evidence has now been obtained that the virus in the living tissues of the plant may be inactivated and destroyed by the passage of a direct electric current of suitable intensity (of the order of 5·0 micro amps. per sq. cm. of tissue). By distillation of infected sap in vacuo it was shown that the virus is not volatile, and so far it has proved incapable of passing through a parchment paper dialyser.

AINSWORTH (G. C.). **Mosaic disease of the Tomato.**—*Seventeenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1931*, pp. 42–43, 1932.

Inoculations from striped tomato plants [*R.A.M.*, x, p. 536] into young healthy ones, by pricking in the juice, friction, or incision of the stem and insertion of portions of necrotic tissue, almost invariably resulted in the development of mild mosaic. The number of plants contracting stripe never amounted to more than 40 per cent. of those inoculated. On the other hand, 'streak', produced by a mixture of potato mosaic virus and mild mosaic of tomato [ibid., x, p. 537], showed certain marked differences from stripe. The resultant symptoms resemble those of stripe but are more severe, the plants showing acute leaf necrosis and stem lesions accompanied by marked stunting. Artificial inoculation by friction with cheese-cloth moistened with infected juice consistently gave 100 per cent. successful infections after five to seven days. Furthermore, it was found that a potash dressing enables striped plants to outgrow the symptoms, whereas it proved useless against 'streak'. The cause of stripe is, therefore, regarded as still obscure. Paine and Bewley showed [in 1919] that *Bacillus lathyri* is capable of inducing the typical symptoms [ibid., i, p. 156], but this organism has since been lost. Other investigators believe that the disease is due to a single or mixed virus.

BEWLEY (W. F.) & ORCHARD (O. B.). **The control of Tomato leaf mould.**—*Ann. of Appl. Biol.*, xix, 2, pp. 185–189, 1932.

Very good control of tomato leaf mould (*Cladosporium fulvum*) has been obtained by two or more applications at weekly intervals (from 19th August onwards) of ⅛ oz. shirlan paste (salicylanilide, supplied by Imperial Chemical Industries, Ltd., London) [*R.A.M.*, x, p. 598], ¼ oz. agral I [ibid., xi, p. 211], and 1 gall. water. In

preliminary tests this mixture also proved satisfactory against cucumber mildew (*Erysiphe cichoracearum*) and the powdery mildews of chrysanthemum and rose (*Oidium chrysanthemi* and *Sphaerotheca pannosa*, respectively). [An abbreviated account of this work is given in the *Seventeenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1931*, pp. 39–41, 1932.]

Bekämpfung der Braunfleckenkrankheit der Tomaten durch Verstäuben von Kupferkalkpulver? Meinungsäusserungen aus Wissenschaft und Praxis. [Control of Tomato leaf mould by dusting with copper-lime dust? Expressions of opinion based on science and practice.]—*Obst- und Gemüsebau*, lxxviii, 5, pp. 75–76, 1932.

Only one of the six German scientific and horticultural experts consulted regarding the use of copper-lime dusts against tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, x, p. 764] had actually used one of these preparations (M. Tillack, Breslau), and he was unable to obtain complete control by this or any other means, including spraying with solbar and sulphur fumigation. In the Winsen [near Hamburg] district, Bordeaux mixture, thisol, solbar, and nosprasit have all been used against *C. fulvum*; of these the last-named is the most effective but has the disadvantage of causing unsightly spotting of the fruits.

SAMUEL (G.). **Macrosporium solani on Tomato fruit.**—*Phytopath.*, xxii, 6, pp. 613–614, 1 fig., 1932.

Macrosporium [*Alternaria*] *solani* is stated to be increasing in prevalence in tomato greenhouses in South Australia, but has never been observed to cause 'nailhead spot' (also attributed to *M.* [*A.*] *tomato*) [*R.A.M.*, x, p. 767]. The fungus may be very severe on the leaves without affecting the fruit, but in a case examined by the writer green fruits of the Early Red Dwarf variety showed hard, sunken lesions mostly starting either at the stem or calyx end but occasionally lateral. On specimens kept in a moist dish for about a fortnight the mycelium spread slowly through the ripening fruit, causing a soft rot with a dark brown discoloration. *A. solani*, therefore, though capable of attacking the fruit, does not appear to be involved in the development of nailhead lesions.

SOLOVIEFF (F. A.). Некоторые редкие и малоизвестные виды грибов Северо- Кавказского края. [Some rare and little known fungi from North Caucasus.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 119–123, 1 pl., 1 fig., 1932.

In this paper notes of taxonomic and local interest are given on the following less common lignicolous fungi in North Caucasus. *Polyporus croceus* (syn. *P. pilotae*) [*R.A.M.*, ix, p. 216] was found on living chestnuts [*Castanea* sp.], causing a mottled heart rot; the writer states that although Jaczewski considered *P. croceus* to be synonymous with *P. rutilans*, these two species are definitely distinct. *P. dryadeus* [ibid., x, p. 141] was found growing at the base of chestnut and oak trees, *P. berkeleyi* on the roots and stumps of the Caucasian fir (*Abies nordmanniana*), *P. giganteus* at the base of beech trees, *Fomes nigro-laccatus* at the base of

living oak trees, and *Poria* sp. on injured and dead stems of *Buxus sempervirens*. A Latin diagnosis is given of *Ceratostomella castaneae* Vanine & Solovieff, n. sp. [see above, p. 616] which causes a superficial greyish-black discoloration of chestnut timber. The oval superficial perithecia measure 68 to 85 by 34 to 43 μ; the base is covered with hairs, 200 to 357 μ long, and the beak, 1100 to 1800 μ in length, is provided with about 10 apical setae, 14·7 to 20 μ long. The bacillary, hyaline ascospores measure 4·4 to 7·4 μ in length.

REITSMA (J.). **Studien über Armillaria mellea (Vahl.) Quél.** [Studies on *Armillaria mellea* (Vahl.) Quél.]—*Phytopath. Zeitschr.*, iv, 5, pp. 461–522, 8 figs., 3 diags., 1932.

A comprehensive and fully tabulated account is given of the writer's studies on *Armillaria mellea*, conducted at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, Holland.

The development of fructifications was found to depend largely on environmental factors. Sporophores developed on a number of solid and liquid media favourable to mycelial and rhizomorph production, e.g., peptone-glucose-saccharose agar, beerwort-salep-agar, X agar (consisting of one part each of cherry agar, peptone-glucose-saccharose agar, and oat malt agar), blotting paper soaked in a peptone-containing nutrient solution, and on fragments of elm branches, the last-named being the most satisfactory. The fruit bodies formed in three to four months at 18° to 22° C. in diffused daylight. On elm twigs they were normal in appearance, whereas those produced on the other media were mostly abnormal though frequently giving rise to viable spores which germinated and produced mycelium and rhizomorphs. The optimum temperature for growth was 25° and the optimum P_H value 5. The formation of rhizomorphs was completely suppressed by constant subculturing of the mycelium in liquid media, but on transference to a solid substratum these bodies reappeared.

Corrosive sublimate, uspulun, germisan, copper sulphate, and copper chloride exercised an inhibitory effect on the growth of the *Armillaria* strains, especially in alkaline media. The phenol derivatives, metadioxybenzol and hydroquinone, suppressed the growth of rhizomorphs in concentrations down to 0·1 per cent., while tannin exerted a stimulatory action on the development of the fungus [*R.A.M.*, ix, p. 278].

Inoculation experiments with *A. mellea* on a number of young trees and plants, either through the soil or through wounds, gave negative results, except for slight mycelial production on the roots of a few *Picea excelsa* seedlings in pots [cf. ibid., x, p. 496]. Soil disinfection tests [full details of which are given] indicated that the best control of *A. mellea* is effected by 0·6 per cent. uspulun or corrosive sublimate (20 l. per sq. m.), carbon disulphide (100 gm. per sq. m.), or 10 per cent. copper sulphate with an admixture of calcium oxide. It was shown by investigations on the behaviour of *A. mellea* in various types of soil that the best growth occurs in light, acid soils, little or no development being made in heavy, alkaline, saline (sodium chloride) soil.

There has been much discussion on the position of *A. mellea*

as an injurious fungus owing to the present imperfect knowledge of its pathogenicity under varying environmental conditions. In the author's opinion, it is best regarded as a facultative parasite with the properties of a perthophyte [ibid., ix, p. 47].

Investigations on the phenomenon of luminescence [ibid., ix, p. 278] and on various other aspects of the physiology and biology of *A. mellea* are described, and a bibliography of 156 titles is appended.

KRAHL-URBAN (J.). **Bekämpfung des Eichenmehltaus.** [Control of the Oak mildew.]—*Forstarch., 1932*, 10, pp. 174–177, 1932.

From 1928 to 1931, inclusive, experiments in the control of oak mildew [*Microsphaera quercina*: *R.A.M.*, ix, p. 548; x, p. 775] were carried out in the nurseries of the forest of Freienwalde (Oder) on one-, two-, and three-year-old seedlings of the common oak [*Quercus robur*]. During the first two years of the tests the incidence of infection was slight, in the later ones somewhat heavier. The treatments were applied in the early morning when the sky was overcast, the preparations used being (1) ordinary ventilated (powdered) sulphur [cf. ibid., ix, p. 16], (2) cosan [ibid., viii, p. 687], both supplied by J. D. Riedel & E. de Haën A.-G., Seelze, near Hanover, and (3) a sulphur dust known as erysimors (E. Merck, Darmstadt), which is not yet on the market. Some of the trees were treated shortly before coming into leaf, others after, while in certain lots the applications were postponed until the first signs of mildew appeared. Intervals of four weeks elapsed between each treatment, the last of which was given at the end of August or beginning of September.

Both the ventilated sulphur and erysimors dusts proved equally efficacious in the control of mildew, while spraying with cosan was less reliable, though not without value. The date of the first application was apparently immaterial provided it was made at or before the first sign of infection. In future one treatment will be given after the trees come into leaf and another on the appearance of the fungus. The manufacturers being unable to supply erysimors at a lower rate than ordinary sulphur dust, the latter will be used. The estimated cost of two applications (including wages) is M. 1·06 per acre. For larger plantations in the open spraying is more likely to be effective than dusting and to cost considerably less.

BROWN (NELLIE A.). **Canker of Ash trees produced by a variety of the Olive-tubercle organism, Bacterium savastanoi.**—*Journ. Agric. Res.*, xliv, 9, pp. 701–722, 7 figs., 1932.

A summarized account is given of the biological and cultural investigation, started in 1913, of a bacterium which was isolated from cankers on branches and twigs of European ash (*Fraxinus excelsior*) received by the author from Vienna. Inoculations with pure cultures reproduced the disease on young American ash trees (*F. americana*), the lesions varying in size from small cracks in the bark with thickened margins to irregular, fluted outgrowths several inches in length and width, with cavities extending into

the wood, and increasing in size and number from year to year on the trunk and the branches. The disease has not been reported in the United States.

As shown in comparative tables, the morphological and cultural characters of the bacterium are very similar to those of *Bacterium* [*Pseudomonas*] *savastanoi* [*R.A.M.*, vii, p. 724, *et passim*] to which the disease was attributed by Vuillemin in 1900. In view, however, of the minor differences [presented in tabular form] and of the fact that the ash organism was shown to be non-pathogenic on the olive and the two strains of *P. savastanoi* from olive which were tested failed to infect the ash [cf. ibid., vii, p. 725], the former is considered to be a variety of the latter, and the name *P. savastanoi fraxini* n. var. is suggested for it.

MILLER (P. W.). **The brown-stain disorder of Filberts.**—*Better Fruit*, xxvi, 9, pp. 7–8, 12, 2 figs., 1932.

Filberts [*Corylus avellana*] in the Pacific Northwest were extensively affected in 1931 by a disorder known as 'brown stain', the first symptom of which is the appearance of a brownish liquid in localized areas on the sides or ends of the nuts; later the internal tissues also become involved, turning watery brown or chocolate-coloured, and the kernel development is arrested. The disturbance seems to reach a climax during the period from 4th to 24th July and to be almost exclusively confined to the Barcelona variety. Different theories have been suggested in explanation of brown stain, but so far the cause has not been definitely ascertained. No infectious micro-organism seems to be involved.

ALBEN (A. O.), COLE (J. R.), & LEWIS (R. O.). **Chemical treatment of Pecan rosette.**—*Phytopath.*, xxii, 6, pp. 595–601, 1932.

Pecan [*Carya pecan*] rosette [*R.A.M.*, ix, p. 208] is stated to be responsible for heavy losses (up to 95 per cent.) in the southern United States. The disease progresses from a mild chlorosis of the upper leaves to dwarfing and crinkling of the foliage, shortening of the internodes, and the ultimate death of the twigs and branches. Rosette seldom or never kills an entire tree, but severe cases may be accompanied by sterility and such great weakness that the affected individuals die from the attacks of borers or other causes. The disease occurs both on residual and alluvial soils, being generally favoured under the former conditions by eroded areas, a light subsoil, light soil texture, and deficiency of organic matter, and under the latter by a high water table and light soil texture. On the alluvial soils of Louisiana, however, rosette is found irrespective of soil type on trees growing near old building sites and the like as well as in very fertile garden soils. Stuart is the most susceptible variety, followed by Frotscher and Van Deman, while Moneymaker is highly resistant.

Previous investigations on the disease [which are summarized] and the writers' observations strongly favour a non-parasitic origin, the development apparently depending on the presence of some unknown soil factor or factors. Rosette does not appear to

spread from diseased to healthy trees but to occur simultaneously on all those in a given locality.

In April, 1930 and 1931, calcium sulphate, manganese sulphate, magnesium sulphate, and potassium chloride were applied to both hill and bottom-land soils and ploughed under, while in August, 1931, ferrous and ferric sulphate were placed in trenches on bottom-land soils. So far none of these treatments has given beneficial results, while the application to the trees, in May, 1931, of these and other compounds was also ineffective. Ferric sulphate and ferric chloride (0·1 to 1 per cent.), however, improved or cured the condition of Schley and Stuart trees sprayed with them in August, 1931; slight burning of the foliage occurred but soon disappeared. Pecan rosette would appear, therefore, to be a form of iron chlorosis [cf. ibid., x, p. 676].

CARTWRIGHT (K. St. G.). **Further notes on Basidiomycetes in culture.**—*Trans. Brit. Mycol. Soc.*, xvi, 4, pp. 304–307, 2 pl., 1932.

This is a brief discussion of the macro- and microscopical characters exhibited by *Polyporus fumosus*, *P. adustus*, and *Lenzites trabea* in pure culture on 2 per cent. Kepler's malt extract agar. It is pointed out that the culture of *L. trabea* was identical in every respect with a culture of *L. thermophila* received from the Centraal Bureau voor Schimmelcultures, Baarn, and also with a culture of *Trametes protracta* sent by Dr. Liese.

LURIE (REBECCA). **Some organisms concerned in mine-timber decay.**—*Trans. Brit. Mycol. Soc.*, xvi, 4, pp. 270–288, 3 pl., 4 figs., 1932.

Isolations from rotted mine timber from a stope in the Rand Gold Mines, Transvaal, yielded six species of imperfect fungi, three of which have not yet been identified, the remaining three being a species of *Fusarium*, one of *Aspergillus*, and the third (identified by Miss Westerdijk) *Bispora effusa* Peck. Tests of the rotting capacities of the six organisms on wattle (*Acacia decurrens*), blue gum (*Eucalyptus globulus*), and pitch pine (*Pinus palustris*) wood, showed that, of the six, *B. effusa* alone was able to destroy the wood in a comparatively short time, reducing the sap-wood of seasoned and unseasoned wattle to a pulpy consistency in six weeks. All the evidence supplied by the investigation indicated that *B. effusa* was the causal organism of the mine timber decay.

The spores of *B. effusa* vary greatly in shape and size, from almost spherical and about 6 to 7 by 4 to 5 μ, to large cylindrical and 18 by 4 to 5 μ. The spores most usually found in cultures were brownish-black, two-celled, and measured 12 to 14 by 4 to 5 μ; they were produced in chains of varying length, no distinct conidiophores being formed. The septate hyphae averaged 4 μ in diameter, their colour ranging from hyaline to almost black.

MANN (R. H.). **Wood preservation—economic and engineering aspects.**—*Civil Engin.*, ii, 4, pp. 223–228, 8 figs., 1 graph, 1932.

A brief historical survey of the development of wood preser-

vation in the United States is followed by observations on the nature of decay and a study of the methods of combating it. The discussion is limited to two preservatives, coal-tar creosote and zinc chloride, which were used for about 98 per cent. of the timber treated in 1930 [cf. *R.A.M.*, viii, p. 619].

The amount of preservative specified per cu. ft. of timber depends largely on the severity of the conditions to be withstood. For highway bridges a 12 lb. retention of creosote is usually specified, while an 8, 10, or 12 lb. treatment by an empty cell process is ordinarily required by power and telephone companies. Formerly railway sleepers were treated with 6 lb. creosote per cu. ft., but larger quantities are now generally specified (8 lb. creosote or $\frac{1}{2}$ to 1 lb. zinc chloride). Reports just submitted by the Chicago, Burlington, and Quincy Railroad, including 1931, show an estimated service life of sleepers treated with these two preservatives varying from 14·33 to 24·8 years, compared with 5·8 for untreated. In 1930 C. C. Cook, Maintenance Engineer of the Baltimore and Ohio Railroad, calculated that American railways were saving $145,000 per day through the impregnation of sleepers, and that when an average life of 20 years or more is realized a daily saving of $387,000 will be effected. A number of creosoted timber bridges that have been in constant use for over 30 (up to 48) years are stated to be still perfectly sound, as shown by the results of an inspection by a committee of the American Railway Engineering Association in California in 1928. The life of full-length pressure-creosoted southern pine [*Pinus ponderosa*] poles has been estimated at 25 to 40 years, and the number treated has increased from 67,541 in 1918 to 2,428,000 in 1930.

The relative costs of treated and untreated timber may best be compared on the basis of annual charges for the material in place. The usual equation for computing the annual charge is: $A = Pr\left(\frac{(1+r)^n}{(1+r)^n-1}\right)$ in which A = the annual charge, P = first cost, n = number of years of service life, and r = rate of interest expressed decimally. Assuming the rate of interest to be 6 per cent., the cost of installing an untreated sleeper $1.40, and its estimated life six years, the corresponding figures for a treated sleeper being $1.80 and 23 years, respectively, the annual charges, using the above equation, will be as follows: for the untreated tie costing $1.40 (6-year period), $0.284, and for the treated, costing $1.80 (23 years), $0.146, giving an annual saving of $0.138 in favour of the latter.

POPHAM (F. T.) & KAMESAM (S.). **A new wood preservative—the 'Falkamesam' process.**—*Indian Forester*, lviii, 4, pp. 191–195, 1932.

The second author, working in Germany under the supervision of Prof. R. Falck on the fixation of arsenic in timber for preservative purposes [*R.A.M.*, xi, p. 216], evolved the 'Falkamesam' process, and tests have recently been conducted to verify the claims of this process at the Dehra Dun Forest Research Institute, India. This method of timber impregnation costs about one-sixth as much

as the creosote treatment and one-quarter as much as that with creosote and fuel oil [ibid., xi, p. 414].

Sapwood blocks, 2 by 1 by $\frac{3}{4}$ in., of *Shorea robusta, Albizzia procera, Pinus longifolia, Abies pindrowi,* and *Terminalia tomentosa* were treated under pressure in a 2 per cent. concentration of the preservative and the amount of arsenic absorbed noted. The blocks were then dried in an oven, leached for about two hours by shaking with 100 c.c. of distilled water in an oscillating machine and soaked in the same water for twelve hours, after which they were analysed for the arsenic washed out. The blocks were then dried in the air for two to three days and the above process repeated twice (except for the soaking), the arsenic washed out after 20,000 oscillations being determined in each case.

The following comparative percentages of washed out arsenic were obtained for 'Falkamesam', Powellizing [ibid., xi, p. 146], zinc-meta-arsenite [ibid., ix, p. 80], and As_2O_5, respectively: *S. robusta,* 3, 33, 23, 43; *Albizzia procera,* 2, 37, 30, and 33; *P. longifolia,* 2, 61, 61, and 36; *Abies pindrowi,* 1, 27, 40, and 47; and *T. tomentosa,* 3, 33, 32, and 23, giving averages for the four treatments of 2, 38, 37, and 37, respectively. The superiority of the 'Falkamesam' process is thus apparent, over 95 per cent. of the originally injected arsenic remaining in the wood after 60,000 oscillations with water, and it is anticipated that a protective influence extending over at least some 25 years may result from this treatment.

SHEWELL-COOPER (W. E.). **Club root of Brassicas.**—*Gard. Chron.*, xci, 2369, pp. 387–388, 1 fig. (on p. 379), 1932.

The results of experiments in 1929 and 1932 in Cheshire on the control of finger-and-toe disease [*Plasmodiophora brassicae*] of cabbage and other species of *Brassica* showed that the use of healthy seedlings is of the first importance. Treatment of infected seed-beds, either by dry heat or with mercuric chloride (1 gall. per sq. yd. of a dilute solution), results in the development of a considerable proportion of healthy plants. In some cases the number of healthy plants may also be increased by puddling in with mercuric chloride [*R.A.M.*, xi, p. 146], which has the additional advantage of controlling the root maggot [*Chortophila brassicae*: ibid., xi, p. 17]. Calcium cyanamide, applied to the permanent beds at the rate of 3 cwt. per acre, improves the quality of the plants and may assist them in withstanding infection. At any rate, it produces an increased number of saleable plants, especially in such crops as broccoli and spring cabbage.

[Further experiments on the same lines, with similar conclusions, are reported in *Gard. Chron.*, xcii, 2379, p. 83, 1932.]

GOE. **Beizung von Gemüsesämereien mit 'tillantin R'.** [Disinfection of vegetable seeds with 'tillantin R'.]—*Obst- und Gemüsebau*, lxxviii, 5, p. 76, 1932.

A marked stimulus to germination and a considerable reduction in the incidence of fungous infections were afforded in recent tests in pot cultures under comparable conditions, at Geisenheim-am-Rhein with tillantin R dust, among the diseases controlled being

blackleg of cabbage [*Pseudomonas campestris*] and bean [*Phaseolus vulgaris*] anthracnose [*Colletotrichum lindemuthianum*]. The following germination percentages were obtained in the untreated and treated lots of seed, respectively: tomato 37 and 88, cucumber 64 and 87, melon 6 and 92, spinach 27 and 72, beet 46 and 133, radish 86 and 94, red cabbage 61 and 94, early Savoy cabbage 79 and 96, cauliflower 18 and 47, head lettuce 19 and 79, field lettuce 62 and 87, leek 44 and 65, celery 27 and 63, bush beans 87 and 94, broad beans [*Vicia faba*] 83 and 95, peas 87 and 96. The incidence of disease (per cent.) in the untreated and treated stands was as follows: cucumber 17 and 2, melon 100 and 13, spinach 64 and 0, beet 43 and 6, red cabbage 54 and 8, early Savoy 34 and 3, cauliflower 100 and 24, bush bean 44 and 7, and peas 17 and 0.

BREMER (H.) & HÄHNE (H.). **Heisswasserbeize zur Bekämpfung der Fettfleckenkrankheit der Bohnen.** [Hot water steeping for the control of the grease spot disease of Beans.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 5, pp. 34–35 1932.

Promising results were obtained in preliminary tests at Aschersleben, Saxony, in the control of grease spot of beans [*Phaseolus vulgaris*] due to *Phytomonas* (*Pseudomonas*) *medicaginis* var. *phaseolica* [*Bacterium medicaginis* var. *phaseolicola*: *R.A.M.*, x, p. 422] by 15 or 30 minutes' immersion of the seed (Rote Pariser variety) in water heated at 52° or 55° C., preceded by 12 hours' soaking in tap water.

SCHMIDT (E. W.). **Die Cercosporakrankheit der Zuckerrübe in Spanien und die Massnahmen zu ihrer Bekämpfung.** [The *Cercospora* disease of Sugar Beet in Spain and measures for its control.]—*Deutsche Zuckerind.*, lvii, 21, pp. 446–448, 4 figs., 1932.

In the districts of Spain where sugar beets are grown under irrigation, ideal conditions prevail for infection by leaf spot (*Cercospora beticola*) [*R.A.M.*, x, p. 427], i.e., temperatures above 25° C. and relative humidities of 98 per cent. during the few hours required for the germination of the fungus. Consequently the disease has assumed a very severe character, necessitating a campaign organized by several of the larger sugar companies and involving 140 field demonstrations of the use of copper sprays in various districts. In these tests about 2,501 hect. were treated with Bordeaux mixture, for the preparation of which a total of 28,686 kg. of copper sulphate was used. In each demonstration portions of the field were left untreated for comparison. The average yield of the treated areas was 49,460 kg. per hect. as against 43,880 from the untreated, the figures for sugar-content and purity being 16·03 per cent. and 86·26 in the treated and 15·31 per cent. and 85·10 in the untreated. The total cost of the demonstrations was 30,031 pesetas and the financial gain from the increased yield of 3,135,641 kg. of sugar is estimated at 1,328,516 pesetas after deducting all the costs.

The choice of the correct time for the first application of the fungicide is of the utmost importance, and is not an easy matter,

since it depends to some extent on climatic conditions and also on the date of sowing. Generally speaking, however, it has been found that the first application should be given about the middle of July, a second a month later, and a third about the middle of September; in some cases the second may be omitted. The mixture must be applied intensively, using not less than 600 l. per hect. [53 galls. per acre] and preferably 800 l. [71 galls.]. The copper content of the Bordeaux mixture should not be less than 1·5 per cent.

Sugar beets growing in the shade of trees have consistently been found to suffer less from leaf spot than those exposed to the sun, and it is suggested that the efficacy of the copper-lime treatment may be partly due to the protection from the sun afforded by the coating of spray [cf. ibid., ix, p. 258].

LACKEY (C. F.). **Restoration of virulence of attenuated curly-top virus by passage through Stellaria media.**—*Journ. Agric. Res.*, xliv, 10, pp. 755–765, 4 figs., 1932.

This is the full account [an abstract of which has been noticed: *R.A.M.*, x, p. 424] of the experiments in which the author succeeded by passage through *Stellaria media* in restoring to approximately the original virulence the beet curly top virus after it had been attenuated by passage through the very resistant *Chenopodium murale.* The attenuated virus remained stable even though passed through successive generations of very susceptible sugar beets. The average weight of beet plants infected with the attenuated virus was almost three times that of beets infected with the virulent or restored forms of the virus.

WEILER. **Gurkenkrätze.** [Cucumber scab.]—*Möllers Deutsche Gärtnerzeit.*, xlvi, pp. 346–347, 353–354, 1931. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxvi, 8–15, p. 340, 1932.]

Cucumbers in German greenhouses are stated to be sometimes so severely infected by *Cladosporium cucumerinum* [*R.A.M.*, vii, p. 6; x, pp. 76, 287 and preceding abstract] in consequence of defective methods of cultivation as to be quite unmarketable. During May and June sharp fluctuations of temperature should be avoided, while watering and sprinkling in the late afternoon are also inadvisable. Diseased fruits should be collected and destroyed immediately and preventive applications of Bordeaux mixture or nosperal-lime [ibid., viii, p. 149] should be given repeatedly. The disinfection of the houses by formalin fumes is recommended after an epidemic.

FRICKHINGER (H. W.). **Achtet auf die Meerrettichschädlinge!** [Beware of Horse-radish pests!]—*Obst- und Gemüsebau*, lxxviii, 5, pp. 77–78, 1 fig., 1932.

Attention is drawn to the severe outbreaks of white blister (*Cystopus candidus*) [*R.A.M.*, iii, p. 506; x, p. 556] which have occurred of recent years on horse-radish in some parts of Germany. In addition to the destruction of old leaves and other plant débris after harvesting the crop, the timely application of a copper-containing fungicide is recommended.

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MURPHY (P. A.) & MCKAY (R.). **Further observations and experiments on the origin and control of Onion mildew.**—*Journ. Dept. Agric. Ireland*, xxxi, 1, pp. 60–76, 1 pl., 1 diag., 1932.

Further investigations [the results of which are fully discussed and tabulated] have been made on the source of mildew [*Peronospora schleideni*] infection in the onion crop at Glasnevin, Dublin [*R.A.M.*, vi, p. 138]. From 1926 to 1929, inclusive, infection was found to have originated from autumn-sown onions that had contracted the disease in the seedling stage from the previous season's spring onion crop, while in 1930 a virulent attack of mildew involving 90 per cent. of the stand was due to soil contamination in the spring.

Early sowing of the autumn crop near diseased spring onions favoured seedling infection, and even when sown at the normal time late in August the crop became mildewed unless the sources of infection were destroyed before the emergence of the seedlings. Sowing at a distance of 500 yards from mildewed onions prevented the development of infection, as did sowing under glass in spring. The occurrence of one infected seedling per thousand in autumn-sown onions in May resulted in a serious outbreak of mildew affecting a quarter or more of the crop. The early removal of such infection centres either suppressed the disease entirely or considerably postponed its development.

The resting spores of the fungus were found in profusion in the leaves and flowering shoots in certain years, but almost entirely negative results were given by germination tests. These organs were shown to survive in the soil in an ungerminated state for at least three years, and proof was obtained in a controlled experiment that naturally contaminated soil freely conveyed the mildew to seedling onions. The fungus is further conveyed through the air by means of conidia during the growing season, but these organs are delicate and short-lived, so that in general the disease was found to remain confined to the neighbourhood of primary outbreaks, at any rate until late in the season. No evidence of seed infection was detected, in spite of flower invasion. When the flowering shoot was attacked the plants failed to set seed.

Observations on varietal reaction to *P. schleideni* indicated that Cranston's Excelsior and Up-to-Date are both resistant as regards

foliage, and the latter also in the bulbs; Bedfordshire Champion and James's Keeping are susceptible in the foliage, but the bulbs of the former consistently showed fair resistance; Ailsa Craig occupies an intermediate position. Of the varieties tested only in two years, Sterling Exhibition and All-the-Year-Round were somewhat susceptible, while one year's observations indicated that Magnum Bonum is also moderately susceptible, Rousham Park Hero intermediate, and Blood Red, Rijnsburger Ui Selected, Roode Ui Selected, and Wethersfield Red distinctly susceptible.

P. schleideni was destroyed by the exposure of infected bulbs to dry heat at 40°, 43°, and 45° C for periods varying according to the size, number, and variety of the bulbs. Under the conditions of the tests, heating for 24 hours at 40° or 43° and for eight at 45° was fully effective.

VAN DER MUYZENBERG (E. W. B.). **Onderzoek over Cladosporium cucumerinum Ellis & Arthur (de veroorzaker van het vruchtvuur van de Komkommer).** [A study on *Cladosporium cucumerinum* Ellis & Arthur (the agent of fruit blight of Cucumber).]—*Tijdschr. over Plantenziekten*, xxxviii, 5, pp. 81–96; 6, pp. 97–118, 3 pl., 1 graph, 1932. [English summary.]

A comprehensive and fully tabulated account is given of the writer's studies in Holland on the fruit blight of cucumbers caused by *Cladosporium cucumerinum* [*R.A.M.*, vii, p. 6]. The symptoms of the disease are described in detail, with notes on its geographical distribution. The optimum temperature for the development of the fungus was found to be about 21° C., with a minimum and maximum of ±0° and ±32°, respectively. Overwintering takes place in the soil or on the framework of the beds or glasshouses, and possibly on rare occasions in the seed coat. The conidia, which are mostly unicellular (22 out of 3709 were bicellular), are disseminated through the air.

Varietal reaction experiments were carried out on plants raised from seed obtained from Holland, the United States, Germany, England, France, and Italy. A few of the French varieties showed a considerable degree of resistance, but in shape and size the fruits of these sorts do not meet the Dutch commercial requirements.

The results of inoculation tests showed that at 35° to 40° germination is quite satisfactory and the young plants remain free from infection. At 30° slight infection was observed, at 25° it was moderately severe, while at 20° the seedlings were totally destroyed by the fungus. On seedlings kept at a temperature of 22° with a relative humidity of 70 to 80 per cent. scarcely any infection occurred, whereas in a fully saturated atmosphere the young growing parts of the plants were liable to very severe attacks. At 20° the incubation period was three to four days.

In order to kill *C. cucumerinum* in the soil, a 0·4 per cent. formalin solution should be applied at the rate of about 10 l. per 3·54 sq. m., followed after a few hours by the same amount of water. Glass, framework, and the like should be treated with 2 per cent. formalin, while in frames disinfection with burning

sulphur or with formaldehyde gas may be practised [cf. ibid., x, p. 631]. All rotting plant débris should be promptly collected and burnt. Suspected seed should be immersed for 30 minutes in 0·5 per cent. uspulun, solbar, or germisan. In addition to the regulation of temperature and atmospheric humidity as indicated above, the application at weekly, subsequently fortnightly intervals, to the young plants of 0·25 per cent. uspulun or solbar (for the later stages 0·5 per cent. of the latter) has given promising results.

GLEISBERG (J.). **Erkrankung der Rhabarberkulturen durch 'Rhizoctonia violacea'.** [A pathological condition of Rhubarb cultures due to *Rhizoctonia violacea.*]—*Obst- und Gemüsebau*, lxxviii, 5, pp. 76–77, 1932.

Rhubarb stands in the Lower Rhine province (Germany) have recently been affected by a disease characterized by general stunting of the plants and the production of small, red leaves. The roots bore the greyish-purple mycelium of *Rhizoctonia violacea* [*Helicobasidium purpureum*: *R.A.M.*, x, p. 692], to which the disease and ultimate death of the plants is attributed. The American Giant variety and all vigorous plants receiving a well-balanced fertilizer escaped the attack. Young, healthy mother plants should be used for propagation, the stands should be renewed at relatively frequent intervals, not left for 20 years as in the locality under observation, and phosphatic fertilizers should be applied.

FAJARDO (T. G.) & MARAÑON (J.). **The mosaic disease of Sincamas, Pachyrrhizus erosus (Linnaeus) Urban.**—*Philipp. Journ. of Sci.*, xlviii, 2, pp. 129–142, 6 pl., 1932.

Particulars are given of a mosaic disease characterized by chlorosis or mottling together with blistering of the leaves (which may be much reduced in size and have a twisted appearance) of sincamas (*Pachyrrhizus erosus*) [*P. angulatus*] reported for the first time from the Philippine Islands [*R.A.M.*, xi, p. 285]. From 30 to 100 per cent. infection has been found both on cultivated varieties and wild plants in Luzon. The virus is systemic, occurring in all the aerial organs including the seed, and also in the fleshy tap-root for which the plant is cultivated, infection being naturally transmitted through the seed and roots. Artificial transmission by the leaf mutilation method of inoculation was successful, but not through the soil or by root contact. The incubation period is about 10 or 15 days and young expanding leaves showing the first symptoms may become thick, stiff, and chlorotic. The mealy bug, *Ferrisia virgata*, commonly found on this plant, appears to play no part in the transmission of the mosaic. The plants are usually stunted or spindly when infection occurs early or is transmitted through the seed, but the presence of the virus does not seem to reduce the vitality of the seeds or shoots arising from infected fleshy roots. Chemical analyses showed that the diseased fleshy roots have lower percentages of reducing and total sugars, pentosans, and dry matter than healthy ones, while the starch percentage is higher in the former. The juice of diseased fleshy roots is less acid than that of healthy ones. Control measures should

be based on careful selection of healthy plants for seed production, early roguing of mosaic individuals, and the development of resistant varieties.

FAES (H.), STAEHELIN (M.), & BOVEY (P.). **La lutte contre les parasites de la Vigne, champignons et insectes, en 1930 et 1931.** [The campaign against fungous and insect parasites of the Vine in 1930 and 1931.]—*Ann. Agric. de la Suisse*, xxxiii, 1, pp. 1–34, 4 figs., 1932.

The meteorological conditions prevailing in Switzerland during 1930 were extremely conducive to the development of vine mildew (*Plasmopara viticola*), which first appeared during the latter part of June and spread rapidly from the beginning of July onwards in a particularly virulent form. In the autumn some hundred oospores could be counted per sq. mm. of leaf surface. Excellent control was again given by eight applications of Bordeaux mixture [*R.A.M.*, xi, p. 24], with or without a standard spreader, interspersed with copper dusts, e.g., Horst's [ibid., x, p. 582] and nosperit, which are ineffectual alone but confer additional protection on the fruit when used from the time of flowering onwards. Colloidal copper preparations, used at low concentrations, failed to give adequate control.

In 1931 little damage was caused by *P. viticola*, but *Botrytis* [*cinerea*] was responsible for heavy losses. The causal organism of coître (*Coniothyrium*) [*diplodiella*] was found to retain its germinative capacity and virulence for at least eleven years. It was experimentally shown that the mycelium of this fungus requires 48 hours to penetrate the pedicels of the grapes, so that the injury from this source may be greatly minimized, in small vineyards, by the removal, within 48 hours of a hailstorm, of wounded grapes with 1 to 2 cm. of their pedicels.

CORNELI (E.). **Sulle previsioni peronosporiche nell'Italia Centrale.** [On mildew warnings in central Italy.]—*Riv. Pat. Veg.*, xxii, 1–2, pp. 1–9, 1932.

Using Lambrecht's polymeter, by which the dew point can be estimated, records were taken during 1930–1 at two localities in the vicinity of Perugia, Italy, where severe attacks of vine mildew (*Plasmopara viticola*) are liable to occur. It was thought that if the dew point (the temperature which brings about favourable conditions for the germination of the zoospores by condensing the moisture in the atmosphere) was higher than 12° C., the lowest temperature at which germination takes place [*R.A.M.*, x, p. 432], an outbreak might be expected.

From the observations made the author concludes that under the conditions prevailing in central Italy, where the average daily temperature in late spring and summer favours infection, the predominating factor conducing to an attack is always the presence of condensed moisture. The saturation point itself, however, is of very little importance in forecasting an outbreak, as this invariably indicated that an attack was likely, since the temperature is nearly always high at such times and the hygrometric degree generally low. The safest procedure in forecasting

vine mildew is to note the changes in atmospheric humidity and temperature, using a thermometer and a psychrometer, and complete these data by direct observations of conditions leading to the condensation of moisture.

VIALA (P.). **Un parasite du mildiou de la Vigne.** [A parasite of Vine mildew.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 19, pp. 654–656, 1932.

As early as 1887, the writer observed in New Jersey that the white patches of the vine mildew fungus (*Plasmopara viticola*) were coloured brick-red by the development of another fungus. Together with P. Marsais, a similar phenomenon was noted in France in the years of the severe mildew epidemics, 1915, 1928, and 1930. The fungus was identified as a species of *Trichothecium* to which the name *T. plasmoparae* is given but without a technical diagnosis. Its slender mycelium surrounds the conidiophores of *P. viticola* and eventually suppresses them by its rapid growth, but it does not penetrate the leaf tissue. *T. plasmoparae* grows best at 18° to 25°, with a minimum at -7° to -10° and a maximum at 37° to 39°. [This paper is reprinted in *Rev. de Vitic.*, lxxvi, 1980, pp. 357–359, 1932.]

RAVAZ [L.]. **La lutte contre le mildiou.** [The campaign against mildew.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 23, pp. 783–785, 1932.

Promising results are stated to have been given in preliminary laboratory tests in the control of *Plasmopara viticola* on the vine by Viala's mildew parasite [*Trichothecium plasmoparae*: see preceding abstract], and a study of its practical applications is projected.

SEMICHON (J.). **Traitement simultané de l'Oidium et du mildiou par le permanganate et par le verdet.** [Simultaneous treatment of *Oidium* and mildew by permanganate and copper acetate.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 17, pp. 598–599, 1932.

In well or stream water (non-stagnant) up to 25° C. and at the ordinary concentrations of 125 to 300 gm. per hectol., potassium permanganate does not begin to exert a decomposing action on neutral crystallized copper acetate (500 to 1,000 gm. per hectol.) until six hours after contact. Contrary to the general opinion, therefore, these two substances may be applied simultaneously to vines for the control of *Oidium* [*Uncinula necator*] and mildew [*Plasmopara viticola*], respectively [*R.A.M.*, v, p. 14; ix, p. 286]. The permanganate is immediately reduced by the organic matter in the green organs of the vine, or by the mycelium of the fungi, and does not interfere with the copper acetate which exercises its usual destructive action on *P. viticola*.

Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1930. [Diseases and pests of cultivated plants in the year 1930.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 44, 50 pp., 2 graphs, 38 maps, 1932.

This survey of the fungous diseases and insect pests attacking

cultivated plants in Germany in 1930 is compiled on the same lines as the previous report [*R.A.M.*, xi, p. 559].

Bericht der Eidgenössischen Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für die Jahre 1929 und 1930. [Report of the Federal Experiment Station for Fruit Growing, Viticulture, and Horticulture at Wädenswil for the years 1929 and 1930.]—*Landw. Jahrb. der Schweiz*, xlvi, 4, pp. 497–592, 3 figs., 5 diags., 1 graph, 2 plans, 1932.

The following are some of the references of phytopathological interest occurring in this report. Osterwalder describes the results of experiments at Wädenswil, Switzerland, in 1929–30 on the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*], white spot of pears (*Mycosphaerella sentina*) [*R.A.M.*, ix, p. 461], and shot hole of cherries (*Clasterosporium carpophilum*) [ibid., ix, p. 467]. Notes are also given on the spotting of unripe apples caused by *Stemphylium maculans* [ibid., x, p. 113], and on the so-called 'Rigi cherry disease', an infectious chlorosis that has been spreading on a tree of the Rigi variety for the last seven years. The chlorosis is of the 'powdery' or spotted type of variegation and the affected leaves show histological changes indicating that they must become diseased while still in the bud. The same disease has been observed on cherry trees near Wädenswil as well as in the cantons of Schwyz and Bern.

Good control of the disease of tulip bulbs caused by *Sclerotium tuliparum* [ibid., xi, p. 376] was given by soil disinfection with uspulun (150 gm. in 20 l. water per sq. m.). Rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xi, p. 578] yielded to two dormant treatments with 8 per cent. carbolineum on 3rd November and 1st April—the latter, however, should have been given earlier to avoid burning of the foliage. One application of 0·5 per cent. kukaka on 19th June was effective against *Actinonema* [*Diplocarpon*] *rosae* [ibid., xi, p. 375], but this preparation has the drawback of injuring the leaves [cf. ibid., ix, p. 465]. The sole treatment so far efficacious in the control of raspberry cane blight (*Didymella applanata*) [ibid., iv, p. 258] on the Preussen and Lloyd George varieties is a summer application of 1·5 per cent. Bordeaux mixture.

GARBOWSKI (L.). **Spostrzeżenia nad chorobami roślin uprawnych w Wielkopolsce i na Pomorzu w okresie 1928–1931 r.** [Observations on diseases of cultivated plants in Great Poland and Pomerania during the period 1928–31.]—*Prace Wydz. Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy.* [*Trans. Phytopath. Sect. State Inst. Agric. Sci. in Bydgoszcz*], 11, pp. 3–50, 4 pl., 1932. [French summary.]

In this report brief notes are given on the more rare or economically important physiological and parasitic diseases which were observed from 1928 to 1931 on cultivated crops in Western Poland [cf. *R.A.M.*, viii, p. 290], among which the following may be mentioned. In one locality rye was found to be infected, in association with *Calonectria graminicola*, by a species of *Hel-*

minthosporium morphologically similar to *H. tritici-repentis* as described and figured by Drechsler [ibid., iii, p. 65], and with which it is provisionally identified though not previously recorded on this host. This identification is supported by the fact that the organism was also found on couch grass [*Agropyron repens*] growing in the midst of the infected rye, suggesting its passage from the former to the latter.

Latin diagnoses are given of two species of fungi which are considered to be new to science, namely, *Cytospora calvillae*, isolated from the surface of a few under-developed Adersleber Calville apples, and *Fusoma persicae*, isolated from dead young shoots of peach trees; the pathogenicity of these organisms has not been established.

Plant pathology.—*Twenty-sixth Ann. Rept. Dept. of Agric. British Columbia, for the year 1931*, pp. U 14–U 17, 1932.

Notes are given on the prevalence of a number of plant diseases in British Columbia during 1931 [cf. *R.A.M.*, x, p. 776], and on the experimental work of the Department's Plant Pathologists [J. W. Eastham and his colleagues] during the year.

NATTRASS (R. M.). **Annual Report of the Mycologist for 1931.**—*Ann. Rept. Dept. of Agric. Cyprus for the year 1931*, pp. 56–64, 2 figs., 1932.

In February and March, 1931, early-sown cumin (*Cuminum cyminum*) in Cyprus showed a disease of the collar and main root constantly associated with a *Stemphylium*; the fungus was invariably isolated from diseased tissue and sometimes the mycelium could be seen investing the plant at ground level. The affected plants had a characteristic appearance, a browning and wilting of the upper parts occurring in the early stages. As the disease progressed the affected plants collapsed in a manner resembling damping-off. The crops sown later were only slightly attacked.

An exceptionally severe epidemic of lentil rust (*Uromyces fabae*) broke out in the Larnaca district in April, infection extending over a wide area and in places completely destroying the crop.

Flag smut of wheat (*Urocystis tritici*) was generally distributed, especially in the west. It is probably of considerable economic importance, but does not appear to have been recognized by the farmers as a definite disease.

In most of the potato-growing areas the autumn crop suffered in August and September from a wilt which occurred sporadically in otherwise healthy crops. Part or the whole of the plants suddenly wilted, the wilting being quickly followed by death. The symptoms corresponded with those caused by *Fusarium eumartii* [*R.A.M.*, x, p. 13], but of the two strains of *Fusarium* that were isolated, the one which was ascertained to cause rotting of potato tubers proved to be another species. It had 3- to 4-septate (predominantly 3-septate) conidia as long as those of *F. solani* [ibid., x, p. 450] but rather narrower than those of typical strains and corresponding better with the measurements of *F. solani* var. *minus*.

A number of orange trees on sweet lime (*Citrus aurantifolia*) stock were destroyed by *Armillaria mellea*, while *Colletotrichum gloeosporioides* caused a rot of mandarin fruits [*C. nobilis* var. *deliciosa*] while still on the tree, and *Dothiorella ribis* [ibid., ix, p. 106] was associated with a die-back of lemon twigs. A *Phomopsis* was isolated from a foot rot of orange on sweet lime stock. The A spores measured 6 to 8 by 2 to 2·5 μ and the B spores 20 to 24 by approximately 7 μ.

Cucurbits and melons were extensively attacked by *Erysiphe cichoracearum*, while watermelons, pumpkins, and *Capsicum* [*annuum*] developed a fruit rot caused by *Brachycladium spiciferum* Bain. The spore measurements of the last-named fungus on the three hosts, respectively, were 32 to 40 by 12 to 14 μ, 29 to 37 by 10 to 15 μ, and 26 to 40 by 9 to 14 μ. A long-beaked *Alternaria* caused a rot of ripe watermelons and was determined at the Imperial Mycological Institute, after comparison with the type, as *A. cucumerina* (Ell. & Everh.) Elliott, with which *A. brassicae* var. *nigrescens* as distributed in Briosi & Cavara's 'Funghi parassiti' No. 422 is considered, in agreement with Elliott, to be identical [cf. ibid., v, p. 471]. The Cyprus fungus has rather smaller conidia than either of these, but the difference is not considered to be specific. In culture it appears to be very similar to *A. macrospora* Zimm. from cotton [ibid., viii, p. 171].

Other records of interest include a species of *Oidiopsis* common on eggplant and tomato, and non-sporing yeast-like fungi of the *Candida* type which caused an active rot of pears and figs still on the trees.

DADE (H. A.) & WRIGHT (J.). **Minor records, division of mycology.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 248–250, 1931.

The following are amongst the diseases recorded in the Gold Coast for the first time in 1930. A previously undescribed form of *Aspergillus flavus*, developing black sclerotia in culture, was parasitic on locusts (*Locusta migratoria migratorioides*). A bacterial blight of sorghum caused the stems to turn red and black and then collapse; the tissues were decomposed and the rotting stalks packed with bacteria. The disease agrees with the bacterial blight [generally attributed to *Bacillus sorghi* Burrill] known in other countries. *Phyllosticta colocasiae* caused a leaf spot of Amankani coco-yams [*Xanthosoma sagittifolium*], the same spots developing on plants in pots containing soil deficient in potash. A root rot of tree tomatoes (*Cyphomandra betacea*) was due to *Phytophthora parasitica*; the disease travelled up the stem, causing a brown discoloration of the cortical tissues, to which the fungus was confined.

Other records include *Corticium vagum* [*C. solani*] causing a collar rot of French beans [*Phaseolus vulgaris*], *Sclerotium rolfsii* on Jerusalem artichoke [*Helianthus tuberosus*] and scarlet runner beans [*P. multiflorus*], a collapse of coco-nut leaves apparently due to unsuitable water relations, and *Botryodiplodia theobromae* on yams (*Dioscorea* sp.).

BROOKS (A. J.). **Annual Report of the Department of Agriculture, Colony of the Gambia, for the year ended March 31st, 1932.**—18 pp., 1932.

Investigations into rosette disease of groundnuts in the Gambia [*R.A.M.*, xi, p. 27] have demonstrated that infection is not seed-borne (a very important point to local growers, as the crop is grown annually from seed), its percentage greatly increases during drought, it is carried over from year to year by the germination of groundnuts left in the ground after reaping, and control does not result from the eradication of self-sown groundnuts, numerous other plants (including petunia, *Vinca*, *Calliopsis*, *Calendula*, star apple trees [*Chrysophyllum cainito*], and *Lagerstroemia*) recently having been found showing typical rosette symptoms. Infection is most prevalent in July and August, and sowings in May and June developed less infection than later ones. Infection with the virus considerably increases the percentage of shell in the nuts. Conclusive evidence was obtained that close planting significantly reduces infection; where 3 by 3 ft. spacing was adopted and the plots kept free from weeds 73 per cent. of the plants were attacked, but when the same spacing was used and the weeds were permitted to grow no disease developed.

In 1922, the author obtained for seed selection purposes groundnut seed from vigorous plants growing on a native farm at Basse, the resultant crop from which formed the variety which the author named 'Basse'. It yielded 2,832 lb. per acre in 1924, and was reported upon by the Imperial Institute as being 78 per cent. kernel, 22 per cent. shell, 51·8 per cent. oil, and 0·49 free fatty acids. It remains one of the best seed varieties in the Gambia and is still markedly tolerant to virus disease. In 1924, a ton of Tennessee Red groundnut seed was imported from the Philippines, and from the progeny the author isolated two varieties, which he named Philippine Pink and Philippine White. These proved to be valuable commercial varieties, the former being the most resistant variety to virus diseases yet found. As in South and East Africa, the insect vector of virus disease in the Gambia has been identified as *Aphis laburni* Kalt. (*A. leguminosae* Theo.) [cf. ibid., ix, p. 19].

It is believed that at least two distinct types of virus attack groundnuts in the Gambia, one producing chlorosis of the leaves and the other characteristic symptoms of the rosette type without chlorosis. Plants infected with each type were grafted together, with the result that the chlorosis rosette appeared in the green rosette type, while the green rosette virus appeared in the chlorotic plants.

WALLACE (G. B.). **Report of the Mycologist.**—*Ann. Rept. Dept. Agric. Tanganyika Territory 1930*, pp. 53–55, [1932].

During the period under review lemon trees in Tanganyika Territory were attacked by a form of canker and a die-back associated with a *Physalospora*, probably *P. fusca* Stevens, on the bark, and a species of *Haplosporella* (*Sphaeropsis*), intermediate in size between *S. malorum* and *H. hesperidica* Speg., on the twigs. A root fungus, probably the C strain of *Rhizoctonia bataticola*

(*Macrophomina phaseoli*) [*R.A.M.*, ix, p. 685] was very destructive on French beans (*Phaseolus vulgaris*). Mangoes were attacked by an angular leaf spot identified as the same as that caused by *Bacillus mangiferae* in South Africa. *Sphaeropsis mori* was present on the stems and *Kuehneola* [*Cerotelium*] *fici* [ibid., x, p. 774] on the leaves of mulberries. An angular leaf spot and stem disease of oleanders was caused by *Pseudomonas savastanoi* E.F.S. var *nerii* [ibid., vii, p. 726]. *Nematospora coryli* [ibid., xi, p. 572] was found in the seeds of cowpea, pigeon pea, and *Phaseolus acutifolius*; the fungus is probably the most destructive parasite of leguminous crops in the Territory, and was found in over 28 per cent. by volume of 5,000 *P. acutifolius* beans examined.

[WALTERS (E. A.).] **Report on the Agricultural Department, St. Lucia, 1931.**—43 pp., 1932.

In the section of this report dealing with plant diseases (pp. 15–16) it is stated that wither-tip of limes [*Gloeosporium limetticolum*: *R.A.M.*, x, p. 160] was very rare in St. Lucia during 1931, mainly owing to the exceptionally low rainfall from January to June, but also partly as a result of improved manurial methods and better irrigation. The final crop was one-third greater than that obtained in 1930.

Conspicuous markings known locally as 'greasy spot' were observed on grapefruit leaves, having been brought about, apparently, through a check to the growth of the trees such as is caused when the roots become exposed to the sun. The application of a complete manure and the protection of the crown roots appeared to be effective in producing a healthy flush of growth.

The root disease of cacao caused by *Rosellinia pepo* [ibid., xi, p. 26] becomes prominent as the shade trees are removed. The replacement of the susceptible 'Immortelle' trees [*Erythrina* spp.] by *Gliricidia* is advised wherever possible, but gradual shade reduction by heavy pruning is much less disastrous.

Pod diseases of cacao (principally *Phytophthora faberi*) [*P. palmivora*, but also due to *Botryodiplodia theobromae*: loc. cit.] associated with wilting of suckers and of the young tips of fresh foliage and with stem canker caused serious losses after the wet months of October and November. *P. palmivora* is dependent on humid conditions, and attention to drainage, removal of excessive shade, and pruning are advised.

The sugar-cane varieties grown in St. Lucia are being replaced by others resistant to gummosis [*Bacterium vascularum*: ibid., x, p. 161] and mosaic; the former disease is now insignificant and the latter no longer present.

JACKSON (T. P.). **Work connected with insect and fungus pests and their control.**—*Rept. Agric. Dept., St. Vincent, for the year 1931*, pp. 7–10, 1932.

In 1931, a cross was made between the commercial tomato variety Bonny Best which in St. Vincent is very susceptible to blossom-end rot [*R.A.M.*, x, p. 707] and an indigenous small-

fruited variety which under St. Vincent conditions has apparently remained immune; no blossom-end rot has so far been noted in the F_1 of this cross, although over 50 per cent. of the Bonny Best were attacked. Back crosses to Bonny Best will be carried out with a view to improving the fruit. Bubbly fruit rot [loc. cit.] caused significant but not serious losses in the tomato crop during the year.

In the section of this report dealing with the cotton experiment station (p. 3) it is stated that observations throughout the 1931–2 season on the rate of incidence of angular leaf spot [*Bacterium malvacearum*] in all the pedigree selections showed that all of the pure Sea Island strains now possess considerable resistance [cf. ibid., x, p. 595].

MILES (L. E.). **Plant pathology at the Mississippi Station.**—*Ann. Rept. Mississippi Agric. Exper. Stat. for 1931*, pp. 43–47, [? 1932. Abs. in *Exper. Stat. Record*, lxvi, 8, p. 745, 1932.]

Excellent control of narcissus root rot [*Fusarium* sp.: *R.A.M.*, viii, p. 42] in Mississippi resulted from soaking the bulbs for one hour in mercuric chloride (1 in 1,000) or for two to six hours in 0·25 per cent. semesan; the best results, however, were given by calogreen and calochlor.

A potash fertilizer applied to cotton on soil heavily infected with wilt [? *F. vasinfectum*] decreased the amount of infection when used in moderate amounts and well balanced with other elements. No significantly better results followed heavy potash applications in relation to the amounts of phosphorus and nitrogen, and the wilt was not further reduced by merely increasing the total quantity of fertilizer applied. Deficiency of potash appeared to increase the amount of wilt more than did deficiency of nitrate.

Tissue platings from 19 cotton plants on *Fusarium* wilt test plots showed the organism present to be a *Verticillium* (tentatively identified as *V. albo-atrum*), in spite of the fact that in each of the preceding five years the soil had been inoculated with *F. vasinfectum*.

BOURIQUET (G.). **Madagascar: list of the parasites and diseases of cultivated plants.**—*Internat. Bull. of Plant Protect.*, vi, 7, pp. 105–107, 1932.

The following are some of the parasites and diseases observed by the writer in Madagascar since October, 1929: coffee rot caused by the mycelium of an unidentified fungus (possibly *Polyporus coffeae*) [*R.A.M.*, ix, p. 32] in association with [the coccid insect] *Lachnodius greeni*, as well as by rhizomorphs resembling those of *Armillaria mellea* [loc. cit.]; oak mildew (*Microsphaera alphitoides*) [*M. quercina*]; anthracnose, brown spot, and 'leprosy' of vanilla, caused by *Calospora vanillae* [*Botryosphaeria vanillae*], *Nectria vanillae*, and *Cephaleuros henningsii*, respectively [ibid., vii, p. 806]; *Sclerotium rolfsii* and rosette on groundnuts [ibid., x, p. 639]; and an *Aecidium* on eggplant leaves and fruits [ibid., vi, p. 144]. Of these, only *Botryosphaeria vanillae* is believed to have been reported previous to the present records.

MATSUMOTO (T.) & SOMAZAWA (K.). **On the relationship between the serological reaction and other biological characters of some putrefactive phytopathogenic bacteria.**—*Journ. Soc. Trop. Agric.*, Formosa, iii, pp. 317–336, 1 pl., 1931. [Received September, 1932.]

A comprehensive account is given of the authors' further experiments at Taihoku, Formosa, on the serological reaction and other biological characters of some related phytopathogenic bacteria, viz., [*Bacillus* sp.] No. 216, a causal organism of the soft rot of pe-tsai [*Brassica pekinensis*], *Bacillus carotovorus* No. 173 (E. F. Smith's strain) and *B. aroideae* No. 174, both from the Lister Institute, London, Nos. 197 from *Zinnia* [*elegans*], 201 from radish, 204 from tomato, 212 from melon, and 403 from onion [*R.A.M.*, x, p. 87]. Nos. 197, 201, 212, and 216 were found to be morphologically similar to *B. aroideae* while 204 is slightly broader; No. 403 resembles *B. carotovorus.* The physiological behaviour of the organisms is recorded in great detail in tabular form.

It would appear from the data obtained in these tests that the organisms comprising the same serological group are also morphologically and physiologically allied. No. 197 was not very closely related to any of the other members of the same serological group. No. 174, the type strain of *B. aroideae,* is serologically distinct from any of the above-mentioned group, but in view of its morphological and cultural similarities to all the organisms under discussion except No. 403, it is considered best to class them all excepting this strain as variants of *B. aroideae.* The serological reaction forms a convenient and serviceable test for bacterial differentiation and identification, but the author considers that it should not be regarded as an infallible criterion of specific distinction.

LACEY (MARGARET S.). **Studies in bacteriosis. XIX. Researches on the group of green-fluorescent bacteria, part II; on some plant diseases caused by bacteria of the green-fluorescent group, and a comparison and discussion of various cultural characteristics of certain members of this group.**—*Ann. of Appl. Biol.*, xix, 2, pp. 190–203, 1932.

Continuing her studies of the green fluorescent group of plant pathogenic bacteria [*R.A.M.*, xi, p. 17], the author describes seven strains isolated by her, namely, one (strain 221) from potato tuber ring disease, five (strains 224, 203, 233, 248, and 238) from various types of lesions on lettuce leaves, and one (strain 234) from large brown necrotic lesions on *Medicago lupulina* seeds. The potato strain is a short, aerobic, Gram-negative, non-sporulating rod with 1 to 5 polar flagella; it does not produce indol and its diastatic action is very feeble; it liquefies gelatine and reduces nitrates with slight evolution of gas; turns milk alkaline but does not coagulate it, and reduces litmus; gives good growth in Fermi's and Uschinsky's solution, with a yellow-green fluorescence; its optimum temperature is 30° C., and there is no growth at 37°. The lettuce strain 224 differs from the former in having 1 to 4 polar flagella, in not reducing nitrates, and in not producing pigment in gelatine or agar media or in broth; the other lettuce strains were very

similar but differed slightly in biochemical properties [which are briefly indicated]. The *M. lupulina* strain has the same characteristics, with the exception that it has only one polar flagellum, does not reduce nitrates, turns milk slightly alkaline with the formation of a soft coagulum, and slowly produces a yellow-green fluorescence in liquid and gelatine media.

The cultural characters of these organisms are compared with those of 32 named species of the green fluorescent group [a list of which is given], and in discussing the cultural variations which were noticed the author fully agrees with Burkholder's statement [ibid., ix, p. 363] as to confusion arising from the tendency to create new species on slight cultural differences.

The author's strain 221 is considered to be most closely related to *Bacterium aptatum*; the lettuce strains come nearest to *Bact. marginale* but are also fairly close to *Bact. aptatum*; and the strain from *M. lupulina* is possibly a physiological form of *Bact. pisi*. It does not appear, however, that any of the characters separating these strains can be relied on absolutely.

DADE (H. A.). **Further observations on Cacao pod diseases in the Gold Coast.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 109–121, 17 graphs, 1931.

In this further progress report (pending a complete study) of investigations undertaken to obtain information on the economic aspects of cacao pod diseases as found in actual practice in native farms on the Gold Coast [*R.A.M.*, vi, p. 657; ix, p. 165] and to study the effect of neglect of cultivation on the physiology of the host, and of irregular, infrequent harvesting on pod diseases, the author presents detailed statistical evidence of production, incidence of disease, and losses in crops grown on test plots. The results obtained may very briefly be summarized as follows.

Infrequent, irregular harvesting results in high loss from pod diseases. As the season progresses the incidence of infection steadily declines. Although a much larger proportion of cacao is damaged by pod disease fungi [*Phytophthora palmivora*, *Colletotrichum ? cradwickii*, *Botryodiplodia theobromae*, and *Trachysphaera fructigena*: ibid., vi, p. 657] in the early output than in the late, inspection of exported cacao failed to reveal any clear indication of a change in quality during the season which might be correlated with this change in the disease situation. Defects in exported cacao are so largely determined by the processes of preparation and subsequent storage that the effect of disease is masked.

In determining the fluctuating annual behaviour of cacao, local environment is at least as important as are meteorological conditions, though the distribution of rainfall and the dry harmattan wind season [December and January] are of the first importance in determining periodicity and magnitude of the crop and, indirectly, the effect of disease.

With regard to the view previously expressed that the site of infections of cacao pods [by *P. palmivora*: loc. cit.] was determined by the morphological characters of the tree and pods, it is stated that evidence since obtained shows that whereas the

proportion of distal infections does not vary appreciably whatever the amount of infection, the greater the incidence of disease the greater the proportion of lateral infections and the less the proportion of proximal infections. The interaction of constant morphological and fluctuating microclimatic factors is probably responsible for the annual variation in the site-distribution of pod infections.

Pod disease arising from cushion canker (*P. palmivora*) results from the previous year's pod infections, but the actual amount of pods that become infected from this source depends on some conditions of the current season. Pod infections from the cushion are not influenced directly by the external conditions which determine infections from other sources, but are determined solely by internal factors. Of these the physiological condition of the tree is probably the most important, the activity of the fungus in the bark being inhibited by the comparatively good condition of the tree in more favourable seasons. In 1928 and 1930 there was relatively little disease from this source, though it was severe in 1929, the former being favourable years for the tree and the latter an unfavourable one.

Systematic records have confirmed the view that cushions infected in one year transmit the disease to the crop of the following year; in the second year the cushions are destroyed by the fungus. The effect of cushion canker on the crop is progressive and very serious; in three successive years the destruction of cushions accounted for losses of 7·5, 8·6, and 5·4 per cent., respectively, of the crop. The crop borne on the remainder of the tree is also affected, as new foci of infection are produced each year from the cankers. This in itself justifies the prompt removal of diseased pods in order to prevent the passage of the disease back to the cushion.

DADE (H. A.). **The determination of incidence of black pod disease of Cacao.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 122–128, 9 graphs, 1931.

Further investigations, based on more exact methods and meteorological apparatus, into black pod disease of cacao (*Phytophthora palmivora*) [*R.A.M.*, viii, p. 26 and preceding abstract] on the Gold Coast (the observations being necessarily confined to the trunk crop, up to about 7 ft. from the ground) showed that the incidence of the disease and hence of the loss of crop is determined by the length of time during which the atmosphere is saturated with water (and the pods are covered with a film of water) and by the proportion of actively infectious diseased pods present on the farm. Other factors such as contact with diseased pods, morphological characters favouring the retention of drops of water in contact with the pods, and pre-existing cushion cankers are constant and subsidiary, being active (except cankers) only as a result of one or both of the two main determining factors; infections due to canker depend neither upon external humidity nor upon external sources of infection, but result from the external conditions of the previous season, and are ultimately subject to the same control as other infections. Both spread of infection and canker can

be controlled by the prompt removal of pods in the early stages of disease.

Owing to the favourable climatic conditions prevailing in the tropical rain forest the disease on the Gold Coast is continuously active throughout the year, though its activity fluctuates with the determining factors. To be effective spraying would have to be so frequent as to be economically impracticable. The best protection against black pod consists in sound methods of cultivation and sanitation.

WRIGHT (J.). **A note on the saprophytic existence in nature of Phytophthora palmivora, (Butler), the causal organism of 'black pod' disease of Cacao.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 251–254, 1931.

An experiment [which is described and the results of which are tabulated] showed that during the dry season in the Gold Coast the causal organism of cacao black pod disease, *Phytophthora palmivora*, when present in the soil, is slowly exterminated by soil saprophytes [cf. *R.A.M.*, i, p. 399]. The fungus was shown to persist in the soil for at least four months. When diseased cacao husks were placed in soil *P. palmivora* was recovered in a strongly virulent form after six months [cf. ibid., vi, p. 658]. The slight risk of infection from husk heaps (carried by tools, insects, animals, wind, etc.), might perhaps be reduced by burying the husks.

STAHEL (G.). **Contribution to the knowledge of witchbroom disease.**—*Trop. Agriculture*, ix, 6, pp. 167–176, 1932.

This is a translation from the Dutch by B. G. Montserin, of the Department of Agriculture, Trinidad, of Stahel's paper, published in 1919 [*Dept. v.d. Landbouw, Surinam, Bull.* 39] on the witches' broom disease (*Marasmius perniciosus*) of cacao.

DADE (H. A.). **A note on the sun-drying of Cacao.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 107–108, 1931.

Under Gold Coast conditions, the sun-drying of cacao during the cropping season is delayed by frequent rains and limited sunshine. In the rain forest zone, where the cacao areas lie, the sky remains overcast for a large part of most days; in one typical instance, for example, cacao required 13 or 14 days to dry, after which it showed over 25 per cent. of mouldy beans [*R.A.M.*, ix, p. 163; xi, p. 30]. The difficulties attendant on sun-drying are largely responsible for the mouldy component characteristic of Gold Coast cacao.

GASSNER (G.). **Über Verschiebung der Rostresistenz während der Entwicklung der Getreidepflanzen.** [On the modification of rust resistance during the development of cereal plants.]—*Phytopath. Zeitschr.*, iv, 6, pp. 549–596, 1932.

A comprehensive and fully tabulated account is given of the writer's investigations, conducted at Estanzuela, Uruguay, in 1927, on the modifications in reaction to rust resistance undergone by cereals in the process of development. The rusts studied were

Puccinia triticina and *P. graminis* on wheat and *P. coronifera* [*P. lolii*] on oats [*R.A.M.*, xi, pp. 358, 630]. All the three rusts were found persisting in the uredo stage during the winter of 1927, and the tests were carried out on plots sown at frequent intervals during the (Uruguayan) autumn, winter, and spring months, March to October.

On the basis of their varying effects on the plants at different stages of growth, the rusts could be divided into two main groups, one represented by *P. triticina* and the other by *P. graminis* and *P. lolii*, the former causing the most severe symptoms on young plants, diminishing as the plant grew older, and the latter on older plants, the younger ones being more resistant. Within the same variety of host plant the degree of infection varied to some extent according to the age of the plant. Thus, in the highly resistant Perez Castellano wheat there was a loss in resistance as the plants grew older, though in this case no difference could be detected in the reaction of leaves inserted at nodes of different heights. In most other varieties leaves of different ages differed in their reaction to infection, and in general it may be said that in each leaf there is a tendency to variation in the reaction to rust during the period between its first development and its full maturity or withering; the extent to which this is manifested differs according to the position of the leaf insertion on the stem. It is pointed out that these discrepancies should be considered in estimating the relative resistance and susceptibility of different wheat and oat varieties to the rusts in question.

Gassner (G.) & Goeze (G.). **Über den Einfluss der Kaliernährung auf die Assimilationsgrösse von Weizenblättern.** [On the influence of potash nutrition on the assimilatory capacity of Wheat leaves.]—*Ber. Deutsch. Bot. Gesellsch.*, l *a* (*Festschr.*), pp. 412–482, 13 figs., 3 diags., 7 graphs, 1932.

In connexion with an exhaustive investigation in Germany on the influence of potash nutrition on the assimilatory capacity of wheat leaves, attention is drawn to the fact, already observed by the first-named writer and Hassebrauk, that plants liberally supplied with potash acquire a high degree of resistance to rusts [*Puccinia graminis*, *P. glumarum*, and *P. triticina*], while marked susceptibility characterizes those deprived of this substance [*R.A.M.*, xi, p. 98]. In the present studies a high assimilatory capacity of the leaves (a prerequisite condition for rust infection) was found to be constantly correlated with lack of potash, so that it is reasonable to connect the presence of this mineral, resulting in a low power of assimilation, with resistance to rust.

Allen (Ruth F.). **A cytological study of heterothallism in Puccinia triticina.**—*Journ. Agric. Res.*, xliv, 10, pp. 733–754, 11 pl., 1932.

This is the detailed and fully illustrated account of the author's investigation of the heterothallism of *Puccinia triticina*, a comprehensive abstract from which has already been noticed [*R.A.M.*, xi, p. 231].

Smith (W. K.). **The effect of different temperatures on the reaction of Hope Wheat to bunt.**—*Phytopath.*, xxii, 7, pp. 615–627, 1 graph, 1932.

In a series of experiments [details of which are given] at Pullman, Washington, the Hope wheat variety has shown a high degree of resistance to three physiologic forms of *Tilletia tritici* [*T. caries*] and two of *T. levis* [*T. foetens*] when planted at the usual date for spring sowing [*R.A.M.*, ix, p. 368], but was moderately susceptible to all five forms in the autumn sowings.

Sowings of Hope and Jenkin, a susceptible variety of *Triticum compactum*, were made in the field in the late autumn of 1929, the seeds being inoculated with a physiologic form of *T. caries* (T2) and sown at weekly intervals from 29th October to 26th November. The percentage of bunt decreased in both varieties in each weekly sowing (from 45·7 and 95·3 in Hope and Jenkin, respectively, on the first date to 4 and 8, respectively, on the last). In the sowings made early in the spring of 1930 (14th March) Hope was resistant (though less so than when sown at the normal dates at the end of March or early April) and Jenkin susceptible (7 and 68 per cent. infection, respectively).

The relation between temperature and reaction to bunt at different stages of growth was determined for Hope and Jenkin with seeds inoculated with T2 and sown in the greenhouse in the winter of 1929–30. Hope proved resistant (1 per cent. infection) when grown at a relatively low temperature (9° C.) until emergence from the soil and then at a higher one (21°), while plants grown continuously in the cool environment were quite susceptible (45 per cent. bunt). Jenkin was susceptible under both high and low temperature conditions.

The different reactions exhibited by Hope in autumn and spring plantings seem to be due mainly to the temperatures prevailing after the emergence of the seedlings. The relative growth rates of Hope and Jenkin at this stage showed that the resistance of the former at the higher temperature is not attributable to more rapid development. Possibly the property in question may be dependent either on adverse nutritional conditions or on an organization of the protoplasm that retards or inhibits the growth of the fungus in a warm environment.

Flor (H. H.). **The production of bunt chlamydospores in the vegetative tissue of the Wheat plant.**—*Phytopath.*, xxii, 7, pp. 661–664, 2 figs., 1932.

During the winter 1930–1 the writer inoculated seedlings of Prelude wheat with paired monosporidial cultures of each of the two bunt fungi, *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*]. The plants were grown in a greenhouse at Arlington Farm, Virginia, at 20° C. and subjected to lengthy periods of artificial illumination. When the heads were approaching maturity the soil was thoroughly soaked to stimulate the production of secondary shoots by plants that had remained free from infection in the first place. A number of the new shoots sent out from the basal nodes were stunted and the leaves bore wart-like galls filled with the chlamydospores of the organisms, those of *T. caries* having reticulately marked walls,

while those of *T. levis* and the interspecific cross were smooth. The galls in the leaves occurred in irregular, non-continuous strands a few mm. to 1 or 2 cm. in length, extending from the leaf blade into the undifferentiated leaf and stem tissue at the node. The galls in the stems were inconspicuous and might have escaped notice but for the twisting and distortion of the affected parts.

LESZCZENKO (P.). **Doświadczenia z nowemi środkami do zaprawiania nasion zbóż przeciw grzybkom głowniowym.** [Tests of new materials for the disinfection of cereal seed-grains against smut fungi.]—*Prace Wydz. Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Sec. State Inst. Agric. Sci. in Bydgoszcz*], 11, pp. 77–86, 1 pl., 1932. [French summary.]

The results [presented in tabular form] of experiments from 1929 to 1931 showed that two new Polish proprietary fungicidal dusts, namely, cyranik of the Chemical Works Azot in Jaworzno and ziarnik, at the rate of 0·2 to 0·4 per cent. by weight of the seed-grain, were as effective in the control of wheat bunt (*Tilletia tritici*) [*T. caries*] and of stripe [flag] smut of rye (*Urocystis occulta*) as steeping the grain in 0·1 per cent. formaldehyde for 30 minutes. Besides their marked fungicidal action, the two dusts also increased the dry weight and the height of plants raised from seed-grain treated with either of them.

TORNOW (ELISABETH). **Einwirkung und Nachweis des Quecksilbers bei der Beizung des Saatguts.** [Action and detection of mercury in the disinfection of seed-grain.]—*Phytopath. Zeitschr.*, iv, 6, pp. 631–637, 1932.

By means of the electrolytic apparatus previously described [*R.A.M.*, xi, p. 361], the writer found that traces of mercury adhered to rye seed-grain dusted ten weeks earlier with ceresan and other organic mercury compounds, as well as to that steeped in germisan (0·125 per cent.) and uspulun-universal (0·2 per cent.). It was found to be impossible to remove the mercury by washing the seed-grain, the use of which for fodder should therefore be avoided.

FLOR (H. H.). **The effect of delayed planting on the control of bunt by copper carbonate dust.**—*Phytopath.*, xxii, 7, pp. 651–655, 1932.

To determine the comparative efficacy of the formaldehyde soak and copper carbonate dust treatments against wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], periodic sowing tests [the results of which are discussed and tabulated] were carried out at Pullman, Washington, during 1930–1. The efficacy of the formaldehyde treatment was found to be fairly consistent, ranging from 88·5 per cent. in the fourth sowing on 29th September to 100 per cent. in the tenth on 10th November, whereas that of copper carbonate decreased with each successive sowing from 94·5 per cent. in the first to 64·8 per cent. in the tenth. Up to and including the fifth sowing, the differences between the treatments were

not significant, but in the later sowing the dust was markedly inferior. Possibly these results may help to explain the numerous failures reported in the commercial use of the copper carbonate dust treatment [cf. *R.A.M.*, x, p. 229].

FRIEDRICHS (G.). **Ein Jahr Überwachung der Lohnsaatbeizstellen in Westfalen.** [A year's supervision of the co-operative seed-grain disinfection plants in Westphalia.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 7, pp. 53–54, 1932.

Of the 140 co-operative cereal seed-grain disinfection plants [cf. *R.A.M.*, xi, p. 36] inspected in Westphalia during 1931, 102 satisfied the necessary requirements, 18 were defective, and 20 useless. Official recognition was eventually granted in 111 cases, i.e., 79·3 per cent. of those submitted for testing and 58·7 per cent. of the total number in the province. Of 228 samples of treated seed-grain examined, 135 or 59·2 per cent. were adequately disinfected. These figures represent an improvement over preceding years, when up to 80 per cent. of the seed-grain was insufficiently disinfected.

SUPPER (R.). **Über die Wirkung von Trockenbeizen.** [On the action of dusts.]—*Zeitschr. für Pflanzenkrankh u. Pflanzenschutz*, xlii, 7–8, pp. 319–350, 1932.

A comprehensive and fully tabulated account is given of the writer's investigations at Hohenheim and other places in Germany, on the influence of the soil type and reaction and the water relations of the seed-bed on the action of certain fungicidal dusts on snow mould of rye (*Fusarium*) [*Calonectria graminicola*], stripe disease of barley (*Helminthosporium*) [*gramineum*], and bunt of wheat [*Tilletia caries* and *T. foetens*]. The experiments on rye were conducted in the greenhouse and those on barley and wheat in the open.

The type of soil (loam, sand, or clay) and the water content of the seed-bed (heavy irrigation immediately after sowing) produced virtually no influence on the action on *C. graminicola* of ceresan, abavit B, and tutan (1·5 and 2 gm. per kg. of seed-grain). Only in soil with a strongly acid reaction (P_H 4·40 or 5·40) was there a certain increase in the efficacy of the dusts, which was least noticeable with ceresan. None of the above-mentioned factors influenced the toxicity of the dusts towards the agents of wheat bunt and barley stripe to any appreciable extent.

In order to determine the length of time required by the dusts to inhibit the development of *C. graminicola* and *H. gramineum*, an attempt was made to stop the fungicidal action (initiated by placing the treated seed-grain in damp sand) by removing or counteracting the fungicide after a given period. This was effected by removing the treated grain by sifting and then washing it with weak acids and lyes, after which it was placed for 20 hours in damp soil, which greatly assisted in removing the fungicide. In the rye experiments it was found that a great proportion (up to 75 per cent.) of the fungicidal effect was neutralized by this treatment, after periods in damp sand of from 5 minutes to 24 hours, in the

case of abavit B; up to 55 per cent. with ceresan; and up to about 80 per cent. with tutan. Similar results were obtained with stripe-diseased barley, the toxicity of all three dusts being largely neutralized by periods up to 34 hours in damp soil.

The germinative capacity of the seed-grain treated with abavit B and tutan was increased by 48 hours' storage previous to sowing [*R.A.M.*, xi, p. 567], while ceresan was not affected.

Robertson (H. T.). **Maturation of foot and root tissue in Wheat plants in relation to penetration by Ophiobolus graminis Sacc.**—*Scient. Agric.*, xii, 10, pp. 575–592, 5 pl., 1 fig., 1932.

The work described in this paper was undertaken for the purpose of determining whether the decreasing susceptibility of the wheat plant, as it grows older, to infection with the take-all fungus (*Ophiobolus graminis*) reported by Broadfoot [*R.A.M.*, xi, p. 291] is correlated with morphological and chemical changes in the maturing base of the host plant, the material used being in part the same as employed by this writer. The part of the plant examined (the 'foot') consisted of the seminal roots developed from the vascular plate of the scutellar node, the subcoronal internode, and the crown roots developing from several crowded nodes which form the 'crown' at the top of the latter. The results showed that the marked falling off of infection in plants over 40 days old is coincident, under greenhouse conditions, with a pronounced increase in the amount of lignified tissue in the foot of Marquis wheat, chiefly occurring in the xylem, pericycle, the fibres of the vascular bundle sheaths, and in the subepidermal layers of the cortex of the crown roots; the cells of the last-named organs become much thickened with advancing age. It is believed that these and other chemical changes at times may prevent further progress of the root-rotting fungi.

The investigation also demonstrated that infection and penetration of the host tissues by *O. graminis* in plants after the seedling stage are essentially the same as described by Fellows for the seedling stage [ibid., viii, p. 369], all the evidence pointing to the fact that extensive penetration of the tissues usually occurs before marked lignification has taken place. The crown appears to be invariably penetrated from the sub-coronal internode and the crown roots, especially the latter.

The appearance of the roots of plants inoculated with a mixture of *O. graminis*, *Helminthosporium sativum*, and *Fusarium* sp. was much the same as that of those inoculated with *O. graminis* alone, the only distinctive morphological character being the usual association with *O. graminis* infection of 'lignitubers' [ibid., viii, p. 370; x, p. 812], while discoloration of the wheat foot is not a reliable criterion, as it may also be associated with drought injury.

Geach (W. L.). **Foot and root rots of Wheat in Australia.**—*Journ. Australia Council Sci. & Indus. Res.*, v, 2, pp. 123–128, 1932.

From foot-rotted wheat [see preceding abstract] obtained from

numerous areas in Australia the author obtained a large number of cultures of *Fusarium* spp., many of which belonged to the *discolor* group, producing, on potato dextrose agar, bordeaux, rose, honey-coloured, and white hyphae, accompanied by the production of bordeaux pigment in the agar. Of these, a large number were macroscopically similar and were identified as *F. culmorum*, the conidial measurements of two isolations that were selected for comparative study closely agreeing with those of a strain from Saskatchewan: these were determined by Wollenweber as *F. culmorum*. Eighteen wheat varieties when inoculated in the glasshouse and the field with transfers from these two isolations all developed typical foot-rot symptoms. In the field tests, some of the plants showed also the whiteheads usually attributed to *Ophiobolus graminis*.

Prissyajnyuk (A. A.). К вопросу об изучении фузариова хлебных злаков. [Contributions to the study of *Fusarium* diseases of cereal crops.]—*Bull. Plant Protection*, Leningrad, v, 1, pp. 173–200, 1932. [English summary.]

The major part of this paper is a condensed review of the recent work done by various investigators in the study of the genus *Fusarium* [most of which has been noticed from time to time in this *Review*]. Considerable details are given of the methods for the culturing and identification of the different sections and species of the genus, synoptic tables and keys of which are given in appendices. This is followed by a brief account of the author's investigation of the species of *Fusarium* that occur in the soil and on a number of cultivated plants, with particular reference to cereal crops, in the Lower Volga basin. Among the species associated with winter injury and other diseases of wheat in the region the following four were isolated and definitely identified, namely, *F. arcuosporum*, *F. arthrosporioides*, *F. solani* f. *minus*, and *F. dimerum*, and their technical descriptions in Russian are given in a separate appendix.

Cormier (P.). **Le Septoria graminum, champignon parasite du Blé.** [*Septoria graminum*, a parasitic fungus on Wheat.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 20, pp. 671–672, 1932.

For the last few years the winter wheat crops in the Vendée and Loire-Inférieure have been severely damaged by *Septoria graminum* [*R.A.M.*, ix, p. 225], the losses from which for the 1931–2 season are estimated at more than a tenth of the harvest. The fungus appears towards the end of December or early in January, producing small, yellow spots which later expand, causing partial desiccation of the collar and stunting of the roots. The disease is more severe on crops following potatoes than on those preceded by clover or fallow. The most susceptible varieties are Japhet and Vilmorin 23 and 27, while Alliés and D. C. Tourneur are relatively resistant. As soon as the disease is observed, nitrogen should be applied in a readily assimilable form in order to increase the resistance of the plants.

OWEN (W. L.). **Ultra-violet rays prevent molding of bread.**—*Food Industries*, iv, 6, pp. 208–210, 3 figs., 1932.

Excellent control of moulds in bread was obtained by the Wm. Wolfe Baking Co., Baton Rouge, Louisiana, by the exposure of loaves to ultra-violet rays (wave lengths of 2,700 to 3,000 Ångström units in one test and of 2,100 to 2,300 in another). *Penicillium* spp. were found to be more resistant to this method of treatment than *Aspergillus* spp. By the application of a continuous fungicidal light to the bread during slicing it was found possible to sterilize the slicer (a prolific source of mould contamination) and inactivate the fungi at the same time.

NAHMMACHER (J.). **Beitrag zur Immunitätszüchtung der Gerste gegen Ustilago nuda forma spec. hordei.** [Contribution to breeding Barley for immunity from *Ustilago nuda* forma spec. *hordei.*]—*Phytopath. Zeitschr.*, iv, 6, pp. 597–630, 1932.

In the course of four years' experiments [the results of which are fully discussed and tabulated] at Halle University the writer inoculated by Seiffert's method 728,450 barley flowers with *Ustilago nuda* forma spec. *hordei* [*R.A.M.*, vi, p. 412]. The apparatus used for the infections was the same as that figured in Grevel's paper on the biological forms of *U. tritici* [ibid., ix, p. 708] and blows the dry spore dust into the flowers by means of an insufflator. Reaction tests on 243 varieties revealed a high degree of resistance in most of the foreign naked (hull-less) sorts of the inaequale type, while the summer varieties of the nutans C group were the most susceptible. Inaequale winter barleys were mostly very susceptible, while some of the two-rowed winter varieties were moderately resistant.

No resistant lines were yielded by selection from crosses between moderately susceptible × highly susceptible and highly susceptible × highly susceptible strains (139 in all), resistant or immune parent varieties evidently being requisite for the production of resistant progeny. The results of eight crosses between resistant and susceptible varieties failed to provide an exact analysis of the factors governing the reaction of the F_3 progeny, but there was some indication of a monomerous tendency to resistance in the resistant varieties. No highly susceptible progeny resulted from a cross between a resistant and a moderately susceptible variety.

On the basis of inoculation experiments with 45 loose smut collections two biologic strains of the fungus were differentiated by their varying behaviour on standard German barley varieties, viz., one from original winter barley producing only 15 and 5·2 per cent. infection, respectively, in two years' tests on Mittlauer Hanna, and one from original summer barley for which the corresponding figures on the same variety were 71·7 and 83 per cent., respectively. Similar results were obtained with the differential varieties, Heil's Franken and Mahndorfer Hanna.

MACKIE (W. W.). **A hitherto unreported disease of Maize and Beans.**—*Phytopath.*, xxii, 7, pp. 637–644, 4 figs., 1932.

This is an expanded account of the writer's investigations on the

'charcoal rot' (*Rhizoctonia bataticola*) on maize and beans (*Phaseolus vulgaris*, *P. lunatus* [var.] *sieva*, and *P. multiflorus*) in California, a preliminary note on which has already appeared [*R.A.M.*, xi, p. 171]. Blackeye cowpeas (*Vigna sinensis*) have also been found infected by the fungus, the pycnidial stage of which (*Macrophomina phaseoli*) has not yet been observed. Large Lima beans, *P. lunatus*, have hitherto escaped infection.

On maize and beans the disease is not visible until the plants approach maturity, and it may cause severe lodging of the maize from the bending or breaking of the stalks near ground level. Apparently the xylem is first attacked but the fungus then spreads to the cambium, phloem, and pith.

SĂVULESCU (T.) & RAYSS (T.). **Influence des conditions extérieures sur le développement de Nigrospora oryzae (B. et Br.) Petch, parasite du Maïs en Roumanie.** [The influence of external conditions on the development of *Nigrospora oryzae* (B. et Br.) Petch, a Maize parasite in Rumania.]—*Comptes rendus Acad. Sci.*, cxciv, 15, pp. 1262–1265, 1932.

The following data were obtained by the writers from their studies on the influence of the hydrogen-ion concentration of the medium and of temperature on the development of *Nigrospora oryzae*, the agent of severe injury to maize rachids in Rumania [*R.A.M.*, x, p. 725]. The viability of the spores is lost after two years, or after one if exposed to air. The minimum, optimum, and maximum temperatures for germination were found to be slightly below 10°, 30°, and 47° C., respectively; the best mycelial growth also occurred at 30°. Damp heat (49·5°) kills the spores in four days; at 51° they succumbed in six hours, at 53° in one hour, at 58° in six minutes, and at 67° in four minutes. The spores are destroyed by 16 hours' exposure to dry heat at 67°.

Spore germination was most profuse, both in a medium of maize meal and in Wollenweber's synthetic medium, when the hydrogen-ion concentration was adjusted to P_H 4·4 to 4·8 by the addition of citric acid, tartaric acid being less effective. Potassium oxide was found to stimulate sporulation, even at an alkaline reaction, to a much greater extent than sodium oxide. At the limits of acidity and alkalinity (P_H 3·5 and 8·4, respectively), as well as at high temperatures (49·5° to 67°), the fungus forms intercalary encystments and abnormal spores.

STOREY (H. H.). **A bark disease of Coffee in East Africa.**—*Ann. of Appl. Biol.*, xix, 2, pp. 173–184, 2 pl., 1 fig., 1932.

An account is given of a bark disease of Arabica coffee which is stated to occur in the Usambara Mountains of Tanganyika Territory; so far, however, serious economic loss is known to have been caused by it in only one plantation, the coffee bushes (some 30 years old) in which were 'stumped' [cut back] in 1927, following which they were heavily attacked by the disease and many were killed by 1930. In green stems the young lesions appear as slightly shrunken areas with a water soaked margin, varying in colour from cinnamon to tawny olive. Later, the lesions darken in colour (with sometimes lighter tones in the centre) and have an

orange halo gradually merging into the normal green of the surrounding healthy tissues. In advanced stages there is a characteristic constriction in the stem; externally the margin of the lesion is usually not sharply delimited, but occasionally it may be bordered by a swollen ridge, in which case the bark tends to shred off and leave the wood exposed. The lesions are usually within a few inches of the base of the shoots, after the death of which they may spread down into the tissues of the stump. The disease usually results in the ringing of the attacked stems, but many months may elapse before the shoots wilt and die, the wilting, when it occurs, being sudden and the leaves remaining attached to the dead shoot for a considerable time. Histologically, all the external tissues of the stems, down to and including the cambium, are killed. No clear evidence was seen of any reaction in the host tissues in advance of the progress of the lesions. On the leaves the fungus causes brown, zonate, circular or irregular spots up to 14 mm. in diameter.

Isolations from the lesions yielded three species of fungi, namely, *Fusarium lateritium* var. *longum*, *F. eumartii*, and *Gloeosporium coffeicola* (which the author considers to be identical with *Colletotrichum coffeanum* [*R.A.M.*, xi, p. 368]). Of these, the first-named alone was shown by inoculation experiments to be pathogenic to Arabica coffee. These tests and field observations indicated that a common mode of entry of the fungus into the stem tissues was through freshly exposed leaf scars, and occasionally by passage from a leaf spot down the petiole. In the field many cases were also seen in which the fungus passed into the shoots through the tissues of a stump from the base of a dead twig. Of the species of *Coffea* tested, *C. arabica* alone exhibited susceptibility to the disease. In giving a brief morphological and cultural description of *F. lateritium* var. *longum*, it is stated that perithecia were not obtained in pure cultures, though the fungus is reputed to be the conidial stage of *Gibberella baccata* [ibid., vi, p. 101].

Although excision of the affected bark of a stump was effective in checking the advance of the fungus, it is considered that this operation is not practicable under plantation conditions.

STOUGHTON (R. H.). **The morphology and cytology of Bacterium malvacearum E.F.S. Part II. Reproduction and cell fusion.** *Proc. Roy. Soc. London*, Ser. B., cxi, B 769, pp. 46–52, 2 pl., 1932.

In continuation of his study of the morphological and cytological details of his strain of *Bacterium malvacearum* [*R.A.M.*, ix, p. 376], the author states that he was able to observe the production of the coccus-like bodies that are budded off from the bacterial rods as mentioned in his previous communication; after the bud forms there appears to be a 'pinching in two' of the 'chromatin' material in the parent rod, after which the coccus, containing a single nucleus-like body, becomes detached from the rod, and after an interval, as yet undetermined, germinates by means of a papilla which appears at one point and grows out into a new rod, apparently identical with the normal vegetative cell. The whole process is reminiscent of the vegetative spore cycle of the lower

fungi. Besides these bodies, others were also seen, apparently arising from the point of fusion of two rods standing at an angle to each other, and liberated by what seemed to be the degeneration of the parent cells. The subsequent history of these spherical bodies ('zygospores'), easily distinguishable by their strong staining properties, has not yet been determined with certainty.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Seed transmission of Cotton wilt.**—*Science*, N.S., lxxvi, 1959, pp. 61–62, 1932.

In 1930 cotton seed of the Half and Half variety collected during the previous autumn in Texas, and known to be infected by wilt (*Fusarium vasinfectum*) [*R.A.M.*, xi, p. 638], was divided into two lots. The seed of one lot was planted in a series of forty cylinders sunk in the ground, tightly sealed at the bottoms and filled with sifted Norfolk fine sandy loam soil that had not been under cultivation for at least fifty years. Untreated seed from the infected plants was sown in wilt-free soil in 20 cylinders, while seed delinted with sulphuric acid and surface-sterilized with 1 in 1,000 mercuric chloride was sown in the other 20. Plants in two of the cylinders of each lot developed typical *Fusarium* wilt, which attacked 3·3 per cent. of the total of 667 plants. On the other hand, not a single plant became wilted among the 723 raised from seed of normal Gorham Lonestar plants sown in the same soil in forty adjoining cylinders. In the second experiment with delinted and untreated seed, respectively, in two boxes, typical wilt developed in both, 2·2 per cent. of 644 plants contracting the disease, while no case of wilt occurred in a third box planted with seed from normal plants.

F. vasinfectum was recovered from all the wilted plants and successfully reinoculated into cotton seedlings. In 1929 and 1930 the fungus was isolated from only a small percentage of the seeds (2·2 and 4·6, respectively), but in 1931 the proportion of internally infected seeds was higher (23·7), the average for the three years being 5·9. In 1930 *F. vasinfectum* was recovered from the tap-roots, main stems, peduncles, and some seeds from every boll of 9 of the 45 plants from which cultures were made. With the other 36 plants the fungus was obtained from the tap-roots, main stems, and peduncles, but not from the seeds. In 1931 the fungus was isolated from some of the seeds from all the bolls of two out of eight plants.

KELLERMAN (K. F.). **Ozonium root-rot—a problem of the eradication of a soil-infecting fungus.**—*Journ. Econ. Entom.*, xxv, 3, pp. 433–434, 1932.

The author states that an outbreak of *Ozonium* [*Phymatotrichum omnivorum*: *R.A.M.*, xi, p. 640], the cotton root rot fungus, discovered a few years ago on the grounds of the date palm [*Phoenix dactylifera*] experiment station at Indio, California (stated to be the most western point in which the disease has been hitherto recorded), was successfully suppressed by injecting the soil, at a depth of 6 feet, with a 1·25 per cent. solution of formalin at the rate of approximately 1 gallon of solution per cu. ft. of soil. The apparatus used for the application is briefly described.

NIÑO (F. L.). **Onixis y perionixis de origen blastomicosico (estudio clinico y micologico.)** [Onychia and paronychia of blastomycotic origin (a clinical and mycological study).]—5a *Reunion Soc. Argentina Patol. Region. Norte, Jujuy, 1929*, pp. 270–281, 1930. [Abs. in *Bull. Inst. Pasteur*, xxx, 8, p. 391, 1932.]

A yeast-like fungus, to which the name of *Monilia periunguealis* n. sp. is given, was isolated from the pus of lesions in the periungueal groove in a case of onychomycosis with paronychia. The creamy colonies contain blastospores and hyphae. The organism was pathogenic to laboratory animals.

HALER (D. H.). **Monilia pinoyi: some further studies in connection with its cultures and chemical reactions.**—*Brit. Journ. of Dermatol.*, xliv, 8–9, pp. 435–444, 1932.

Continuing his studies on *Monilia* [*Candida*] *pinoyi* [*R.A.M.*, x, p. 790], the writer again found that the medium of choice for this organism is 1 per cent. glucose agar, closely followed by 1 per cent. mannitol agar. Maltose, galactose, glucose, mannite, and dextrin were fermented with acid production (and gas in the case of the first-named). All the 17 strains at present maintained in culture have remained absolutely constant in regard to their sugar reactions. One strain was found to resist desiccation for three and another for four weeks. The growth of the organism was inhibited by brilliant cresyl blue at concentrations of 1 in 50,000 and upwards in broth dilutions without sugar, as well as by 0·02 per cent. $CuSO_4$ or $Cu(NO_3)_2$. Monsol also completely inhibited the growth of *C. pinoyi* at a dilution of 1 in 500, while at 1 in 200 it killed the fungus.

From a small series of animal experiments the writer claims to have satisfied Koch's postulates with regard to the causation of paronychia by *C. pinoyi*, the fungus having been isolated from human cases, inoculated into animals with positive results, and recovered from the lesions thus induced. The human cases under investigation comprised eight of paronychia, one each of onychia and vaginitis, three of buccal infection, and two of dermatitis accompanied by mild paronychia. The most striking feature of the animal experiments was the rapid death consequent on intravenous injection of living cultures of *C. pinoyi*, and the complete absence of symptoms when killed cultures were used.

HALER (D. H.). **Bronchomoniliasis.**—*Brit. Med. Journ., 1932*, 3726, pp. 1052–1053, 1932.

Referring to G. Oliver's observations concerning the prevalence of bronchomoniliasis in Jersey [*R.A.M.*, xi, p. 645], the writer states that, in his extensive experience as pathologist to the London Infants' Hospital, he has been unable to isolate a true *Monilia* [*Candida*] from sputum, though the organisms are relatively frequent in children's mouths, even in the absence of clinical signs of infection. Some twenty strains of the fungus are now in culture, derived from 70 cases of paronychial moniliasis and buccal infection (mostly the former), in none of which the pulmonary system was involved. It would appear from these data and the

author's other published work (*Brit. Journ. of Dermatology*, xliii, p. 343, 1931) that *Candida* is of etiological importance only as an agent of epithelial infections of the skin and mucous membranes.

MARETT (P. J.). **Bronchomoniliasis.**—*Brit. Med. Journ., 1932*, 3729, p. 1190, 1932.

The writer does not accept D. H. Haler's claim that *Monilia* [*Candida*] is of no importance as an agent of pulmonary infection [see preceding abstract]. In 1931 the sputa of 579 individuals were examined at St. Helier, Jersey; of this number 90 showed mixed infection of tubercle bacilli and blastomycetes, 326 were positive for the latter, chiefly represented by *Monilia* [*Candida*], while 163 were negative for both types of infection. During the period of eleven years covered by these routine bacteriological examinations, the annual number of deaths from pulmonary tuberculosis has fallen from 69 to 34.

HALER (D. H.). **Bronchomoniliasis.**—*Brit. Med. Journ., 1932*, 3732, p. 122, 1932.

Replying to P. J. Marett's criticisms of his experimental work on bronchomoniliasis [see preceding abstract], the writer deals *seriatim* with the various objections raised. As regards the supposed role of the blastomycetes in the causation of the disease in Jersey, as evidenced by their constant presence in the sputum, it is pointed out that no proof is forthcoming in support of this statement. Such *Monilia* [*Candida*] spp. as may be found in the course of post-mortem examination may be merely secondary invaders or even accidental air-borne contaminants. The occurrence of these organisms in the sputum does not necessarily imply that they are causal, any more than the yeasts which are of such frequent occurrence in carcinoma ventriculi. The fact that the mortality from pulmonary tuberculosis in Jersey has fallen by 44 per cent. in ten years can scarcely be ascribed solely to the improved diagnosis of bronchomoniliasis, especially as the corresponding figure for England and Wales is about 12 per cent. during the same time.

DESSY (G.). **La chémiothérapie des mycoses. I. Partie: Aspergillose. II. Note. Expériences 'in vivo'.** [The chemicotherapy of mycoses. First part: Aspergillosis. Second note. Experiments '*in vivo*'.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iv, 4, pp. 113–118, 1932.

Experiments on a rabbit artificially inoculated with *Aspergillus fumigatus* showed that crystal violet, brilliant green [*R.A.M.*, ix, p. 327 *et passim*], chloride of copper, and to a less degree dahlia, are endowed with a good degree of chemicotherapic power, especially when these substances are inoculated into the subject contemporaneously with the infective material.

DESSY (G.). **La chémiotherapie des mycoses. IIème Partie: Penicillose.** [The chemicotherapy of mycoses. Second part: Penicilliosis.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iv, 4, pp. 119–126, 1932.

In studies of the power of inhibition on the development of

cultures and of the fungicidal power *in vitro* (both on the spores and mycelium) of 51 colouring agents and 24 metallic salts [cf. preceding abstract] carried out on *Penicillium brevicaule*, *P. luteum*, *P. candidum*, and the *P.* sp. of Carbone and Cazzamalli (a description of which is given in 'Studi sulla etiologia della pellagra' by Carbone and F. Cazzamalli, *Rivista Sperimentale di Freniatria*, 1913), the author ascertained that very active inhibition of growth in culture was brought about by brilliant green (1 in 10,000 to 1 in 2,000), methyl violet (1 in 5,000 to 1 in 500), malachite green (1 in 2,000 to 1 in 500), and alizarin blue (1 in 2,000 to 1 in 1,000): crystal violet was effective (at 1 in 2,000) against *P. candidum* only. The most active metallic salts were mercury cyanide (1 in 40,000 to 1 in 20,000), mercuric chloride (1 in 20,000), cadmium nitrate (1 in 5,000 to 1 in 500), and aluminium sulphate (1 in 5,000 to 1 in 500). All the above-mentioned colouring agents and metallic salts were fungicidal *in vitro*, but not to any marked degree.

It is concluded that all species of *Penicillium* are very resistant *in vitro* to the action of colouring agents and metallic salts.

DATTA (S.). **A new fungus Eidamella actoni parasitic to the dog.**—Reprinted from *Indian Vet. Journ.*, viii, 10 pp., 2 pl., 1932.

From lesions on the skin of a dog in Calcutta the author isolated a fungus which in culture developed a mycelium with chandelier branching and perithecia. The chlamydospores were intercalary, lateral, and terminal: the intercalary and terminal ones were generally round, of various dimensions; the lateral ones less numerous, oval or piriform, and sessile or briefly pedicellate. Conidial bushes were also present. During the development of the perithecium, straight, septate spines grew out of a central mass, lengthened considerably, and narrowed almost to a point. Bodies resembling pectinate hyphae also developed in the central mass. The asci formed in the centre of the mass were numerous, round, and contained more than eight ascospores. The organism, while resembling *Eidamella spinosa*, differed from it in the septate spines and in the number of ascospores. It is provisionally named *E. actoni* [without measurements or diagnosis].

Inoculations into healthy dogs gave typical lesions, from which the fungus was re-isolated. From evidence accidentally obtained it is probably transmissible to man.

GREGER (J.). **Pergamentpapier als Träger von Schimmelpilzsporen.** [Parchment paper as a carrier of mould spores.]—*Zeitschr. für Untersuch. Lebensmittel*, lxiii, 5, pp. 560–564, 1932.

Writing in the *Oesterr. Milchwirtsch. Zeit.*, xxxviii, p. 46, 1931, K. Schuch describes a test with a parchment paper used for wrapping butter which was found to bear 614 mould spores per 100 sq. cm. After four days in the refrigerator the butter enclosed in this paper emitted a very musty smell, and after eight days a rancid and mouldy flavour was detected. This paper differed from

the other samples examined (those bearing 5 or 6 spores per 100 sq. cm. being designated as 'very good' and those with 78 as 'good') in containing a trace of iron.

In connexion with these statements the present writer obtained samples of parchment paper from the Olleschau factory at Prague (Czecho-Slovakia) and subjected them to various treatments (moistening with a nutrient solution or sterile tap water and holding in thermostats at 28° C., at a room temperature of 15°, and in refrigerators at 2° and 9°). No spores developed on any of the samples except in one case where a single colony was formed, probably due to infection contracted through handling in the tests, so that paper fresh from the factory may be regarded as free from mould contamination. When the samples were left exposed for 48 hours, those soaked in nutrient solution yielded about three spores per 100 sq. cm., while no growth was obtained on those moistened with sterile water, or on butter packed in these papers and held in a damp atmosphere. Butter from a shop was then wrapped in papers soaked in a nutrient medium and inoculated with pure cultures of *Penicillium glaucum* and *Aspergillus niger* [*R.A.M.*, xi, p. 181], but no infection developed, presumably owing to the use of a preservative. When butter was procured direct from a dairy, slight mould development occurred after three days in the thermostat, or five days at room temperature, in the samples wrapped in paper saturated with a nutrient solution. Where sterile water was used, however, no infection developed after 14 days, even after artificial inoculation. Paper obtained from a shop and treated with a nutrient solution developed eight centres of mould infection per 100 sq. cm. in five days in addition to bacteria.

It would appear from these results that there is no great risk of impairing the quality of butter by the use of parchment paper.

Heyes (T. F.) & Holden (H. S.). **An investigation of the action of certain species of Penicillium on artificial silk.**—*Journ. Textile Inst.*, xxiii, 5, pp. T79–T94, 1932.

A brief account is given of experiments in which five types of commercial artificial silk were subjected *in vitro* to the action of five species of *Penicillium*, namely, *P. pinophilum*, *P. lilacinum*, *P. purpurogenum* var. *rubri sclerotium*, and two undetermined species, one of which is closely related to the last-named. The results [which are presented in the form of tables] showed that acetate silk is more resistant to attack by these fungi than any other of the types tested, and that stretching in the spinning process appeared to confer some power of resistance to non-esterified silks. No correlation could be established between the degree of previous degradation of the cellulose and its susceptibility to the moulds. While considerable 'tendering' [*R.A.M.*, iv, p. 281; viii, p. 38] of the silk may result from the growth on it of the moulds, without any microscopically detectable injury, the type of damage that was visible under the microscope did not vary from one species of *Penicillium* to another for any one type of artificial silk. Non-esterified silks were damaged most severely by *P. purpurogenum* var. *rubri sclerotium* and its allied species, while *P. pinophilum*

did much less damage on them, in contrast to its behaviour on cotton which was attacked equally by all three of these species. The two first-named organisms normally cause the formation of additional reducing groups, presumably aldehyde groups, when acting on either cotton or non-esterified artificial silks.

LUDWIGS [K.]. **Vom Asternsterben.** [On the dying-off of Asters.]—*Blumen- und Pflanzenbau*, xlvii, 7, p. 108, 1932.

Popular notes are given on the dying-off or wilting of China asters [*Callistephus chinensis*] in Germany, associated with infection by *Fusarium* spp. and with defective cultural measures [*R.A.M.*, x, p. 315]. Suitable methods of control are briefly indicated.

SWIFT (MARJORIE E.). **Pythium crown- and stem-rot of Begonia.**—*Journ. New York Bot. Gard.*, xxxiii, 391, pp. 141–143, 1 fig., 1932.

A brief note is given in popular terms on the occurrence and control in New York of a virulent crown and stem rot of begonias due to *Pythium de Baryanum* [*R.A.M.*, vi, p. 359]. A rapid soft rot developed at the base of the stem or higher up, and soon the stalk collapsed. Inoculations with *P. de Baryanum* isolated from the affected plants caused healthy plants to collapse in four days.

CAYLEY (DOROTHY N.). **'Breaking' in Tulips. II.**—*Ann. of Appl. Biol.*, xix, 2, pp. 153–172, 2 pl., 1932.

A summarized account is given of the author's continued investigation of 'breaking' in tulips [*R.A.M.*, viii, p. 384], the results of which confirmed the infectious nature of the causal agent of the disease, which was transmitted by grafting and plugging bulbs with tissue from affected bulbs, but not by injections of filtered diseased sap. All attempts to induce 'parroting' by grafting gave negative results [cf. ibid., x, p. 599]. No correlation could be established between the type of 'break' exhibited by the plant from which the inoculum was derived (termed the 'transmitter') and the type of 'break' induced, and it was shown that different varieties vary in their susceptibility to infection with the agent derived from the same transmitter. 'Breaking' was observed to occur naturally under garden conditions in some other species of *Tulipa*, e.g., *T. eichleri* and *T. greigii*, and the condition was also induced in them by grafting with 'broken' garden varieties. The bi-colour Keizerkroon variety was found to be a true bi-colour, and not a 'break', but 'breaking' in the red areas of the perianth was caused by grafting with diseased material.

The effect of the virus on the colour plastids and the distribution of the anthocyanin sap-pigment [cf. ibid., xi, p. 183] is briefly discussed, and some data are given on the translocation of the virus in the bulb. The work also indicated the importance of insect control during the growing season and during storage for the prevention of the disease.

PRETI (G.). **Sulla presenza del 'Pythium de Baryanum Hesse' nelle piante di 'Cereus'.** [On the presence of *Pythium de Baryanum* Hesse in *Cereus* plants.]—*Riv. Pat. Veg.*, xxii, 5–6, pp. 121–132, 5 figs., 1932.

In September, 1931, young *Cereus grandiflorus*, *C. marginatus*, and *C. spachianus* plants growing under glass on the Italian Riviera were affected by a fatal wilt which had first been noticed on a few plants in the previous March and had gradually affected the whole nursery. The disease spread as a brown spotting and wilting from the base of the plants to the top.

The infected tissues contained a hyaline, non-septate, little branched mycelium, and, near the collar, spore-bearing external hyphae, 3·9 to 5·8 μ in diameter also developed. Conidia measuring approximately 20 μ and germinating by means of a germ-tube were formed within the tissues. The zoosporangia measured 24 to 30 μ and contained oval biciliate zoospores 29 by 14 μ in diameter. The mature oogonia (which were formed within the tissue) reached 23 to 28 μ in diameter and had a hyaline wall 2·9 μ thick. The oospores were round, 18 to 26 μ in diameter, and completely filled the oogonia. The straw-coloured antheridia were somewhat clavate, with a thickened epispore. The fungus is provisionally identified as *Pythium de Baryanum* (*sensu lato*).

Experimental evidence demonstrated that excessive, persistent humidity was necessary for infection.

Brief, practical notes are given on control, and a bibliography of 23 titles is appended.

NATTRASS (R. M.). **Cercospora disease of Calotropis procera.**—*Min. of Agric. Egypt. Tech. & Sci. Service Bull.* 106, 6 pp., 7 pl., 1932.

Calotropis procera, a common ornamental plant in many parts of Egypt, is liable to severe infection by a species of *Cercospora*, the pathogenicity of which was established by inoculation from pure cultures.

During the latter part of May and early June, circular, water soaked lesions, 7 mm. or more in diameter, appear on the leaves. With the production of conidiophores and conidia the spots turn dark olive (Ridgway) with a paler margin on the upper surface and yellowish-olive on the lower. Towards the end of the summer most of the infected leaves are shed, but a few remain attached to the plant during the winter and serve to perpetuate the fungus. The primary outbreaks of the next season are due to the conidia developing in profusion on the water soaked zones surrounding the old dried areas on the leaves. Infection normally takes place through the stomata.

The fasciculate, slightly flexuous, light brownish-olive, non-septate conidiophores, measuring 33 to 45 μ in length, arise from a characteristic stromatic mass of hyphal tissue. The straight or slightly curved, pale yellowish-olive, subcylindrical to abruptly obclavate, 1- to 3-, occasionally 4- or 5-septate conidia are of variable size, measuring 35 to 54 by 5 to 8 μ in the early summer, 38 to 93 μ in length in September, and up to 100 μ long towards the end of the season.

A comparison of the Egyptian organism with what is believed to be the type material of *C. calotropidis* from the Herbarium of the Missouri Botanical Garden left no doubt as to the identity of the two forms. The synonyms of *C. calotropidis* are given as *C. microsora* Pat. non. Sacc. [*R.A.M.*, viii, p. 347], *C. patouillardi* Sacc. et D. Sacc. [ibid., x, p. 693], *C. inconspicua* Pat. et Har., *Napicladium calotropidis* Morstatt, and *C. domingensis* [ibid., vi, p. 259].

PHILIPP (W.). **Woher der schlechte Kleestand?** [Whence the poor Clover stand?]—*Die Kranke Pflanze*, ix, 6–7, pp. 61–63, 1932.

A brief, popular account is given of what is commonly called 'winter injury' of clover, in reality due to the attacks of *Sclerotinia trifoliorum*, in Germany [*R.A.M.*, x, p. 669], the damage from which was very severe during the season of 1931–2. Control measures, based on crop rotation and suitable cultural methods, are briefly indicated.

KUSANO (S.). **The host-parasite relationship in Olpidium.**—*Journ. Coll. Agric., Imper. Univ. Tokyo*, xi, 4, pp. 359–426, 10 figs., 1932.

Olpidium trifolii and *O. viciae*, which are found in the field in Japan only on white clover (*Trifolium repens*) and *Vicia unijuga*, respectively [*R.A.M.*, viii, p. 580], infected a number of other leguminous plants through wounds, under laboratory conditions, including clovers, groundnut, *Vicia faba*, *Phaseolus angularis*, lucerne, *Vicia sativa* var. *angustifolia*, yellow lupin (*Lupinus luteus*), French bean (*P. vulgaris*), soy-bean (*Glycine soja*), cowpea (*Vigna catjang* var. *sinensis*), peas, and *Sophora japonica*, besides attacking pieces of living tissue of 63 out of 81 species of phanerogams of various families tested. Some of the plants reacted by the formation of tumours, while in others there was no external sign of infection, though the fungus often developed normally and liberated gametes after the usual period of maturation. The latter, therefore, may act as carriers of the fungi, being susceptible to infection but resistant to, or immune from any resulting disease. The hosts reacting in the former manner to *O. viciae*, namely, *V. unijuga*, *V. faba*, and peas are of the latter type in respect to infection by *O. trifolii*, and vice versa.

The effect of the fungi on the hosts is similar whether the epidermis or the internal cells on the wound surface are attacked. Further tests on the young unwounded epidermis showed that each fungus can penetrate the epidermal cells of the hosts of the other, but the invaded cell does not enlarge and the development of the fungus is not so vigorous (though it may reach maturity) as in cells exposed by wounding. *O. viciae* caused typical tumours on *Vicia faba* and pea seedlings or young shoots, though it has not yet been observed in nature on these hosts. *O. trifolii* caused only small necrotic spots on these hosts, but formed galls on *T. pratense* and *T. incarnatum* when care was taken to inoculate young tissues. On a number of other Leguminosae tested the

fungi penetrated and developed but no external symptoms were produced.

All parenchymatous tissues from the various plants liable to infection exert an apparent positive chemotaxis on the swarm cells (gamete and planozygote). The juices of the plants in question were also found to contain the chemotactic substance. Potassium compounds were the only ones of several water-soluble substances examined to induce positive chemotaxis on the swarm cells of both organisms. The wide host range may be attributed to the universal occurrence of potassium in the higher plants, and especially in the susceptible young internal cells of the shoot and root. The resistance of some plants may be due to the secretion of substances injurious to the approaching swarm cells, while in other cases the protoplasm of the host is uncongenial to the parasite. Many susceptible plants may remain unaffected in nature, since their morphological and anatomical characters, growth forms, or habits prevent the penetration of their susceptible cells by the fungi.

Specimens determined as follows and occurring in Czecho-Slovakia were sent to the author by Dr. E. Baudyš: *Synchytrium (Olpidium) trifolii* on *Trifolium repens* and *Urophlyctis bohemica* Bubák on *T. repens*, *T. hybridum*, and *T. montanum*. All these, however, were clearly *O. trifolii* as it occurs in Japan. The diseased spots on *T. montanum* are similar to those observed by Bubák (*Zentralbl. für Bakt.*, Ab., 2, viii, p. 817, 1902) as caused by *U. bohemica*, but the fungus present in the specimen examined was clearly not the same as that described and figured by Bubák. It is evident that this plant is attacked by two distinct fungi causing similar symptoms.

SCHOLZ (W.). **Bisherige Forschungsergebnisse betreffend die Chlorose der gelben Lupine (Lupinus luteus) in ihrer Beziehung zum Eisen. (Vorläufige Veröffentlichung.)** [Results so far obtained from researches connected with chlorosis of the yellow Lupin (*Lupinus luteus*) in its relation to iron. (Preliminary publication).]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, A, xxv, 5–6, pp. 287–293, 1932.

The work of previous investigators on chlorosis of the yellow lupin (*Lupinus luteus*) in Germany [*R.A.M.*, ix, p. 742] is summarized, and a preliminary announcement made concerning the writer's studies in Silesia, which are stated to have shown that it is directly correlated with iron deficiency.

GUYOT (A. L.). **Observations sur la distribution géographique comparée de quelques espèces végétales et de certains de leurs parasites naturels. (2e Note). Sur quelques champignons parasites des Graminées.** [Observations on the comparative geographical distribution of some plant species and of certain of their natural parasites. (2nd Note). On some fungi parasitic on Gramineae.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 2, pp. 36–47, 1 pl., 1932.

In this further account of studies on the geographical distribution of plant parasites and their natural hosts [cf. *R.A.M.*, x, p. 274] the author states that early in the winter of 1931 he noted

near Beauvais (Oise) a greyish-violet, later black spotting of the young green leaves of *Agrostis alba* var. *stolonifera*, caused by a fungus with simple, brown-olivaceous conidiophores measuring 29 to 44 by 6 to 8 μ. The single, terminal, subspherical to spherical, brown-olivaceous conidia were 11 to 13·5 μ in diameter. Perithecia developed as single or multiple loculi in a subepidermal stroma; they were usually present only on the upper surface of the leaf, and were depressed, later erumpent. The oblong-elongated, sometimes slightly curved, uniseptate, hyaline ascospores measured 15 to 23 by 5 to 7 μ (average 19·6 by 6·3 μ).

The conidial stage approached nearest to *Hadrotrichum virescens* Sacc. et Roum. [ibid., iv, p. 17] reported on *A. vulgaris* in Bohemia, on *Lolium perenne* in Holland, and on an undetermined grass in the Ardennes. Saccardo's *H. agrostidis* is close to this fungus. *H. microsporum* Sacc. et Malbr. var. *macrosporum* Karst. reported in Scandinavia on *A. alba* is, in the author's opinion, only a pale-spored form of *H. virescens*. All these forms should fall into the one species, which by reason of priority should be named *H. virescens* Sacc. et Roum. The perfect stage is referred to the genus *Scirrhia*, and most closely approaches *S. agrostidis* Wint., [ibid., vii, p. 642] found on *A. stolonifera* in central Europe and on *A. rivularis* in Portugal, though the average ascospore dimensions of the type (24 by 8 μ) are larger than those found by the author. Saccardo's *H. agrostidis* was regarded by him as the conidial stage of this fungus, which he termed *Dothidella agrostidis* (Fuck.) Sacc. (= *Phyllachora agrostidis* Fuck.). Winter's reference of the fungus to the genus *Scirrhia* is, however, preferred by the author.

Notes are also given on *Phyllachora sylvatica* on the living leaves of *Festuca duriuscula* [*F. ovina*] at Bury (Oise), *Physalospora festucae* on the leaves of *Melica uniflora* at Famechon (Somme), and *Puccinia ammophilae* n. sp. on *Ammophila arenaria* [*A. arundinacea*] at Cayeux (Somme). The fungus previously reported as causing a witches' broom of *Silene maritima* [ibid. x, p. 745] was definitely identified as *Uromyces behenis*.

NIETHAMMER (ANNELIESE). **Die Beizwirkung von Germisan auf die Keimung einzelner Wiesengräser bei unterschiedlichen Keimtemperaturen.** [The steeping action of germisan on the germination of certain meadow grasses at different germination temperatures.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xlii, 7–8, pp. 364–383, 1932.

Seed of the meadow grasses, *Poa*, *Festuca*, and *Trisetum* spp. exposed to varying temperatures (2° to 25° C.) after one hour's immersion in 0·125 or 0·25 per cent. germisan underwent, generally speaking, no far-reaching injury, such as marked protraction of the germination period or appreciable reduction of germinative capacity. The effects of the treatment, however, vary to some extent with the particular conditions of germination [full details of which are shown in the 15 tables supplementing the discussion]. Treated seed subjected to the action of frost (12 to 14 hours in a refrigerator at −10°) was liable to a reduction of germination not observed in the untreated. On the whole, the results of these

experiments are considered to justify the disinfection of meadow grass seed.

The permeability of the grass seeds and of Gold oats to various dyes (0·1 per cent. methylene blue, chrysoidin, and orange G) was studied, and it was found that, as in the case of wheat, but to a much greater extent, the substances accumulate in the pericarp at the tip of the seed [cf. *R.A.M.*, x, p. 256]. Chrysoidin was the only one to penetrate the interior of the seed through the testa after 16 hours, and not until the end of 30 hours' immersion did small amounts of the other dyes gain entry. The embryo, therefore, is well protected from injury. Assuming that germisan behaves similarly to these dyes in regard to the penetration of the seed, no damage from this source need be anticipated.

ARK (P. A.). **The behaviour of Bacillus amylovorus in soil.**—*Phytopath.*, xxii, 7, pp. 657–660, 1 fig., 1932.

A specialized technique was adopted for the isolation of the pear blight organism (*Bacillus amylovorus*) from naturally and artificially infested Californian soils. In order to inhibit the Gram-positive organisms present in large numbers in unsterilized soil, Patel's ox-gall medium was used [containing sodium taurocholate: *R.A.M.*, vi, p. 19; xi, p. 561], with crystal violet in the proportion of 1 in 100,000 instead of 1 in 500,000. Superficially sterilized green pear fruits or parts of fruits were punctured with needles and immersed in suspensions of the soils to be tested, and then removed and incubated at a temperature favourable to the growth of *B. amylovorus*. The organism was found to persist for 54 days in sterilized loam and clay soils at 8° C. and for 30 days at 21° and 28°; in sandy soil it lived for 18 days at 8° and 21° but was killed immediately at 28°. In unsterilized samples the duration of viability was 30 days in loam at all temperatures, 38 in clay at 8° and 21° and 14 at 28°, and 14 22, and 18 days in sand at 8°, 21°, and 28°, respectively. *B. amylovorus* was isolated from moderately moist or dry orchard soils under conditions indicating persistence for at least several weeks (up to seven or eight months in one case).

JENKINS (ANNA E.). **Elsinoe on Apple and Pear.**—*Journ. Agric. Res.*, xliv, 9, pp. 689–700, 3 pl., 1 fig., 1932.

Continuing the study of *Plectodiscella piri* [*R.A.M.*, viii, p. 469] the author states that the examination of material sent in by various workers and also of the fungus on apples and pears intercepted on arrival in the United States from different European countries leads her to interpret the structures which were described by Woronichin under the term 'epithecium' or 'shield' as being agglomerations of the conidiophores of its *Sphaceloma* stage. In a comprehensive review of the history and taxonomy of the organism she shows that the reasons advanced by Woronichin for not placing it in the genus *Elsinoe* are not valid, the same also applying to Theissen's and Sydow's reason for separating the families Elsinoeaceae and Plectodiscellaceae. Arnaud's transference of *Elsinoe* to the genus *Uleomyces* still wants confirmation [cf. ibid., x, p. 578]. For all these reasons she places *P. piri* in

the genus *Elsinoe* which she maintains as a distinct genus, with *Plectodiscella* and *Melanobasidium* as synonyms. *P. piri* thus becomes *E. piri*; and *U. piri*, *Gloeosporium pirinum*, *Hadrotrichum piri*, *H. populi* var. *piri*, *H. pirinum*, and *Melanobasidium mali* are synonymous with it. *P. veneta* is renamed *E. veneta* n. comb. [cf. ibid., ix, p. 66].

Reference is made in the paper to the *Sphaceloma* stage of *Plectodiscella* spp. on various plants, most of which have not heretofore been reported as hosts for this group of fungi. Examination of typical material of *H. populi* [ibid., iii, p. 746] on *Populus nigra* shows that this fungus possesses the characteristics of the genus *Sphaceloma* and is possibly a distinct species; it is therefore renamed *S. populi* (Sacc.) n. comb.

In discussing the distribution of *E. piri* it is stated that so far the fungus is not known to occur in the United States.

ANDERSSEN (F. G.). **Chlorosis of deciduous fruit trees due to a copper deficiency.**—*Journ. Pomol. and Hort. Science*, x, 2, pp. 130–146, 5 pl., 1932.

A brief account is given of a diseased condition of deciduous fruit trees in South Africa, which occurs almost exclusively on deep, well-drained, light sand or sandy loam soils, either poor or rich in humus, with an acid reaction (P_H 5·5 to 6·5). The symptoms vary considerably from one kind of fruit tree to another. Most plums, peaches, and apricots exhibit a marked yellowing of the leaves, the interveinal areas being very pale green to bright yellow, and in extreme cases the smaller veins being also discoloured. This is accompanied by a serious rosetting with cessation of terminal growth, formation of multiple buds, and dying back of the branches. The Gaviota plum appears to be more resistant than most varieties, and the Kelsey and Wickson the most susceptible. Early varieties of peaches seem to be more susceptible than later ones. While pears and apples do not exhibit yellowing of the leaves very often, the rosetting is very conspicuous in the apples and the leader branches die back; rosetting is absent in the pears, but the tips and apical leaves become badly scorched, resulting in die-back. Very often one half of a large tree becomes affected a year or two before the other half. The roots of diseased trees appear quite normal externally. The cropping capacity of the affected trees is considerably reduced or may even be destroyed. Attempts to remedy the condition with applications to the soil of fertilizers containing potassium, manganese, magnesium, sulphur, and iron gave negative results in every case.

Chemical analysis of plant material from affected trees consistently showed a deficiency of copper, which was traced from the leaves and fruits down to three-year-old bark and wood, and to the roots. The ash content of the chlorotic material was always much higher than that of normal material. Experiments in the Ceres district of the Western Cape Province indicated that the trouble is amenable to treatment by applications to the soil of copper in the form of copper sulphate at the rate of from $\frac{1}{4}$ to 2 lb. per tree. Leaves dipped in a very dilute solution of copper sulphate resumed their green colour within two weeks.

MARSH (R. W.) & WALKER (MARY M.). **The scab fungus (Venturia inaequalis) on Apple shoots.**—*Journ. Pomol. and Hort. Science*, x, 2, pp. 71–90, 2 pl., 2 diag., 1932.

The investigation reported in this paper was made at the Long Ashton Research Station near Bristol for the purpose of supplying the lack of information in the literature [a cursory review of which is given] concerning the early stage of shoot infection by the apple scab fungus (*Venturia inaequalis*) [*R.A.M.*, ii, p. 318; x, p. 37; xi, p. 50]. As seen on the Apple variety Lord Suffield, the only noteworthy departure from the processes accompanying the germination of the spores and the penetration of the host cuticle, as described by Wiltshire for leaf infection, is that in shoot infections the appressorium is little developed and sometimes absent. In the latter, the infection hypha, growing between the cuticle and the epidermis, first branches to form a thin plate of cells which eventually develops into a lens-shaped pseudoparenchyma forcing the cuticle and epidermis apart. The epidermal cells in contact with the fungus collapse, and by the end of the first week from infection these cells are invaded. At a slightly later stage the subepidermal cells are also killed, and a pad of pseudoparenchymatous fungal tissue (stroma) is rapidly formed and forces the bark outwards. This invasion continues into the surrounding epidermal cells and is not checked when the epidermis becomes the phellogen, but the further development of the stroma is affected by the formation of cork barriers in the host tissues, and while the invasion continues to spread tangentially, it remains during summer confined radially by the bark tissues above and the collenchyma below. The cork barriers may enclose the stromata completely, in which case the latter wither and may be shed, together with the remains of the host tissues external to the barrier, but frequently a vigorously developing stroma may outgrow the barrier, so that although the central mass of the stroma is cut off and dries up, small masses of mycelium remain unenclosed by the cork barrier. During winter the fungus continues to grow between the collenchyma and the bark, and forms subsidiary pustules, from which a deeper penetration takes place along the line of the phellogen from which the first cork barrier arose. This affords protection to the subsidiary pustules, which are the only organs of the fungus that produce spores for the renewal of infection in the following spring. In the second year of infection, the abscission of infected tissue is much more rapid than the gradual formation of the cork barriers of the previous late summer and autumn, and only very rarely does any living portion of an infection persist on a shoot beyond the summer following that of its initiation. The direct damage caused by scab to the shoots is slight, but the importance of scabbed wood lies in its effect on spring infection of the leaves.

The rest of the paper is a brief discussion of the external conditions influencing the course of infection on the Lord Suffield variety, the dissemination of spores from scabbed shoots, and the variations observed in scab attack on shoots of some varieties other than Lord Suffield. A brief reference is also made to the difficulty of killing the scab pustules on the shoots by direct spraying.

PARKS (T. H.). **The Ohio spray service.**—*Journ. Econ. Entom.*, xxv, 3, pp. 543–544, 1932.

In giving a brief outline of the work done by the Ohio Spray Service, the author states that it is chiefly concerned with the proper timing of the treatments for the control of apple scab [*Venturia inaequalis*: *R.A.M.*, xi, p. 654] and codling moth. It is further stated that apple growers who strictly adhered to the spray schedules recommended by the service, produced 86·4 per cent. absolutely clean fruit in 1930, rising to 89·9 per cent. in 1931, in spite of the fact that codling moth in both years was quite serious.

WORMALD (H.). **Bacterial canker as a cause of dieback in Plum trees.**—*Journ. Min. Agric.*, xxxix, 3, pp. 208–217, 4 pl., 1 fig., 1932.

This is a popular version of the author's account of the die-back of plum trees in England, caused by *Pseudomonas mors-prunorum* [*R.A.M.*, xi, p. 379]. The disease, which is apparently present in most of the districts where plums are grown, is particularly severe on Victoria and Czar plums, and Bradley's King damsons, but most of the varieties commonly cultivated appear to be susceptible to it; so far, however, it has not been recorded at East Malling on the varieties Utility, Monarch, and Diamond. Besides the stems and limbs of the trees, the disease also causes a spotting of the shoots, leaves, and fruits, and there was evidence that the organism lives over the summer, during which it dies out from the stem and branch cankers, on the green organs, whence in the autumn it again infects the stems and branches. Preliminary tests have shown that most of the similar cankers found on sweet cherry, Morello cherry, peach, and some other stone-fruit trees, are also caused by *P. mors-prunorum*.

Tentative recommendations for the control of the disease, based on the biological characters of the organism, are appended.

OGILVIE (L.). **Hard rot of Strawberry fruits.**—*Ann. Rept. Agric. & Hortic. Res. Stat. Long Ashton, Bristol, for 1931*, p. 118, 1 pl., [1932.]

In 1930 and 1931 a large proportion (amounting to 80 per cent. in the former year) of Paxton strawberries in Herefordshire were rendered unfit for canning through the formation of hard, brown, sunken areas with a large number of seeds.

The disease on the fruits was associated with a *Septoria* which also produced roughly circular leaf spots, about 0·5 cm. in diameter, with brown centres and reddish-purple margins. These spots bore black, sunken pycnidia about 100 μ in breadth and 125 μ in height. The cylindrical, obtuse, usually 3-septate conidia were slightly constricted at the septa and averaged 40 by 5 μ.

Small purple spots sometimes appeared on the sepals, which later became brown and covered with pycnidia; this condition led to the infection of the green fruits and the development of the hard areas. Much damage was also caused by shrivelling of the flower-stalks and flowers.

The fungus, which was obtained in pure culture, was provi-

sionally identified as *S.* [*Mycosphaerella*] *fragariae* [*R.A.M.*, x, p. 584].

Tests indicated that some control is possible by spraying before fruiting with Bordeaux mixture.

THOMAS (H. E.). **Verticillium wilt of Strawberries.**—*California Agric. Exper. Stat. Bull.* 530, 16 pp., 4 figs., 1932.

This is an expanded account of the writer's investigations on the strawberry wilt caused by *Verticillium albo-atrum* in California, a preliminary note on which has already appeared [*R.A.M.*, xi, p. 187].

ZELLER (S. M.). **Armillaria crown rot of Strawberry.**—*Phytopath.*, xxii, 7, pp. 665–666, 1 fig., 1932.

Several cases of localized patches of crown rot of the Marshall strawberry due to *Armillaria mellea* have been examined west of the Cascade Mountains, Oregon [*R.A.M.*, x, p. 163]. The diseased plants (about 17 per cent. of the total patches) were somewhat dwarfed and showed considerable yellowing of the leaf mesophyll. The site of one of the plantings studied was formerly occupied by oaks, while that of another had previously borne a mixture of oaks (*Quercus garrayana*) and various shrubby trees. In the former case the infected plants were scattered over the area of five acres, resulting in a loss of some 6 per cent., while in the latter the disease was uniformly distributed and affected about 23 per cent. of the plants covering seven acres. Cultures have been made from 196 plants which yielded 144 (73·5 per cent.) isolations of *A. mellea*.

DARROW (G. M.). **Varietal resistance to the 'double blossom' disease of the Blackberry in North Carolina.**—*Plant Disease Reporter*, xvi, 1, pp. 3–4, 1932. [Mimeographed.]

In eastern North Carolina and southwards blackberries and dewberries are liable to severe damage from 'double blossom' [*Fusisporium rubi*]. The wild blackberry (*Rubus* (?) *floridus*) and the red-caned dewberry (*R. trivialis*) are commonly infected, while the sand blackberry (*R. cuneifolia*) is practically immune. On 1st May, 1931, over 99, over 90, and 50 per cent. infection was observed on the common British, Oregon Evergreen (*R. laciniatus*), and Evergreen × Himalaya blackberry varieties, respectively, while Himalaya, Burbank Thornless, and Nanticoke were completely healthy and Brainerd (Himalaya × erect) showed only 1 per cent. of double blossom. Five per cent. infection was found on one lot of Mammoth selfed dewberries, two others being healthy, as also were Austin Thornless and young plants from which the old and new canes were cut off after the 1930 harvest.

WARDLAW (C. W.) & MCGUIRE (L. P.). **Pitting disease of Bananas. Its nature and control.**—*Trop. Agriculture*, ix, 6, pp. 193–195, 1932.

The re-investigation of the transit wastage in banana cargoes from Brazil to England [*R.A.M.*, xi, p. 189] is claimed by the authors to have established that it is primarily due to infection

(invisible at the time when the fruit is put in cold storage prior to transport) of the bunches in the plantations with *Piricularia grisea* [ibid., vi, p. 637], a fungus which hitherto was chiefly known as pathogenic to rice and other Gramineae. This was clearly shown in cold storage tests in Santos, Brazil, in which apparently healthy bunches of the Cavendish, Giant Fig, and Silk varieties were found on their removal to the ripening room to have developed spotting or pitting typical of the trouble, chiefly on the cushions and finger stalks of the two top hands, and occasionally on the finger stalks of the third and fourth hands. A similar localized infection was also present down one side of the main stalk and, in some bunches, towards the distal ends of the individual fruits (fingers). Isolations from the lesions in their earliest stage of development repeatedly gave pure cultures of *P. grisea*, which was also found sporulating abundantly on the spots after a few days in the ripening room. While the radial spread of the organism in the banana tissues is strikingly localized, the underlying tissues are usually deeply penetrated, this preparing the way for invasion by secondary fungi, e.g., *Gloeosporium musarum* and *Fusarium* sp., which cause rapid decay and soon lead to finger dropping and other wastage in transit.

The investigation also indicated that in the Brazilian banana plantations the infection with *P. grisea* originates in the 'transition' or 'protecting' leaves (the last of the series of green vegetative leaves immediately overhanging the bunches) and bracts, which were found in most cases to be abundantly infected; from these the spores are carried to the bunches by the downward passage of atmospheric water. The precise time at which infection of the finger stalks and cushions occurs has not yet been determined, but it has been definitely shown that the infections of both *P. grisea* and *G. musarum* remain latent or dormant until the fruit is reaped and placed in storage.

In the light of these observations, the trouble may be controlled by weekly or fortnightly inspection (according to the prevailing weather conditions and the number of new bunches being formed), during which the 'transition' leaves should be removed by means of a sharp knife, and the bracts protecting the hands carefully detached. This treatment is stated to be very simple and quite inexpensive. Sun scorch of the bunches may be avoided by bending down an overhanging leaf.

REICHERT (I.) & HELLINGER (E[STHER]). **On Botrytis tip-end rot of Banana fruits in Palestine.**—*Hadar*, v, 7, pp. 162–163, 2 figs., 1932.

Botrytis cinerea attacks the floral end of banana fruits in Palestine rather commonly during the wet winter months, producing a dark brown discoloration as it progresses towards the stem end. The brown rot is generally preceded by a clear watery band. The withered floral leaves and the large bracts protecting the flowers and the fruit 'hands' are also liable to infection. Inoculation experiments on healthy green banana fruits, wounded and unwounded, gave positive results. *B. cinerea* has previously been found attacking roses and citrus in Palestine [*R.A.M.*, viii,

p. 236], but this is stated to be the first record of its occurrence on banana. Attention is drawn to the likelihood of diseased bananas serving as a source of infection to the citrus groves with which they sometimes are interspersed.

NICOLAS (G.) & AGGÉRY (Mlle). **Une maladie grave du Néflier du Japon.** [A serious disease of the Loquat.]—*Bull. Soc. Hist. Nat. Afrique du Nord*, xxiii, 4, pp. 101–105, 1932.

In this further account of the infection of loquat (*Eriobotrya japonica*) at Toulouse by an organism closely agreeing with *Bacillus amylovorus* [*R.A.M.*, xi, p. 305] the authors, who give the dimensions of the organism as 1 to 1·5 by 0·5 to 0·8 μ, state that in 1932 identical symptoms appeared on other loquats in the same garden as well as on some in a distant suburb. The disease was also reported at about the same time from Palermo [ibid., xi, p. 117].

CROSBY (C. R.). **The spray service in New York.**—*Journ. Econ. Entom.*, xxv, 3, pp. 539–542, 1932.

In this paper the author gives a brief outline of the organization and activities of the Spraying Service for the control of fruit, potato, and vegetable diseases in the State of New York, which is conducted jointly by the departments of Entomology and Plant Pathology. In issuing notices timing the spray applications every possible source of information is made use of by the agents of the Service, who are greatly assisted in their work by the co-operation of the United States Weather Bureau. A special forecast is prepared each evening during critical periods and sent to each county agent. Besides purely practical purposes, the Service also pursues educational aims, by giving lectures in the early spring to the local growers, in which all the problems of insect and disease control likely to arise are thoroughly discussed.

MARTIN (H.). **The laboratory examination of fungicidal dusts and sprays.**—*Ann. of Appl. Biol.*, xix, 2, pp. 263–271, 1 graph, 1932.

This is a brief discussion of the advantages and drawbacks presented by laboratory tests of the efficacy and toxic action of fungicidal sprays and dusts used in the control of plant diseases. While capable of giving much more accurate and definite data than field trials, it is pointed out that the practical value of laboratory experiments is entirely dependent on the correctness of the allowances made for the influence of the variable factors that operate in the field.

McCALLAN (S. E. A.) & WILCOXON (F.). **The precision of spore germination tests.**—*Contrib. Boyce Thompson Inst.*, iv, 2, pp. 233–243, 1 graph, 1932.

In stressing the importance of accuracy in spore germination tests in relation to the evaluation of the toxic properties of fungicides in the laboratory, the authors state that the variations that usually occur in replicate tests are due either to lack of uniformity in the experimental conditions or to a factor known in variational statistics as 'errors of random sampling'. While the latter factor

is unavoidable, the former may be reduced to a negligible quantity by careful technique, and a method is indicated (the χ^2 test) by which it is possible to determine to what extent such errors have been eliminated. This test was applied by them to the results (covering a total of 160,000 spores germinated in the presence of various fungicides) obtained with three species of fungi, namely, *Sclerotinia americana, Pestalozzia stellata,* and *Uromyces caryophyllinus* [*R.A.M.*, x, p. 742], and it was found that in the case of the two first-named the errors due to faulty technique were negligible, while with the last, where the fungicide was subjected to artificial rain before germination of the spores [ibid., xi, p. 385], the results were more variable. A discussion is given of the form of toxicity curves and of the theories underlying them [cf. ibid., iii, p. 536].

SEMPIO (C.). **Meccanismo di azione dello zolfo nella lotta contro le Erisifacee.** [The mechanism of the action of sulphur in the control of the Erysiphaceae.]—*Ann. di Tecnica Agraria,* v, 1, pp. 4–60, 1932.

After briefly discussing various theories which have been put forward to explain the fungicidal action of sulphur [*R.A.M.*, xi, p. 195], the author gives a full account of his investigations into the subject, using the conidial stage of *Erysiphe graminis* as the test fungus.

At temperatures from 12° to 57° C. sulphur did not give rise to acid compounds when exposed in a thin layer to sunlight in various conditions, or when sprinkled on wheat leaves, and it is thought, therefore, to be toxic only in the molecular stage.

Sulphur is considered to act chiefly by contact; the gases which emanate from it attain sufficient pressure to be toxic only in its immediate vicinity, though they may assist in the destruction of the fungus on the parasitized, treated organs of the host. The marked fungicidal activity of the sulphur colloids results from the fact that when they pass into very fine suspension in water they effect contact with the fungus over a very large area.

The fungicidal efficacy of sulphur is not affected by the P_H value of the medium to which it is exposed, and therefore cannot be due to those compounds of the metalloid which are destroyed when the P_H value passes above or below certain narrow limits.

Sulphuric acid solutions at concentrations of 0·1 to 0·2 per cent. slightly weakened the germinative power of the conidia of *E. graminis* but produced a much more destructive effect on the host tissues. Solutions of sulphurous acid at concentrations of 0·1 to 0·2 per cent. stimulated germination of the spores but killed wheat leaves in a few hours. If these acids were formed on green tissues treated with sulphur they would therefore injure the host much more than the parasite.

Solutions of sodium thiosulphite (0·5 to 1 per cent.) had no effect on the conidia of *E. graminis*.

Solutions of sulphuretted hydrogen as dilute as 0·04 to 0·07 per cent. were markedly fungicidal to the conidia of *E. graminis*, while being perhaps less injurious to green host tissues than sulphurous or sulphuric acid solutions.

If acid compounds of oxidization were formed in nature on the

sulphur-treated green organs of the host such compounds would not injure the parasite, and might actually stimulate it.

The only compound which can be formed by sulphur in small quantities while the mycelium is decomposing under the effect of the metalloid and which might be injurious to the fungus is sulphuretted hydrogen, but the rapid dispersion and marked instability of this gas are such that even if small quantities did form on the green host organs, they could have only quite a secondary importance in destroying the fungus, as the gas would not have sufficient time to reach the minimum pressure at which it is toxic to *E. graminis*.

The fact that, excepting sulphuretted hydrogen, all the sulphur compounds were very slightly toxic to *E. graminis* or even, in small doses, favoured germination of the conidia, confirms the view that it is only the elementary form of sulphur which is specifically and markedly toxic to the Erysiphaceae.

The action of sulphur upon *E. graminis* has two aspects: it almost completely inhibits the germination of the conidia, while at the same time it rapidly destroys the mycelium.

Natural sulphurs are also markedly fungicidal against *E. graminis*, and provided they contain not less than 20 to 25 per cent. sulphur may safely be substituted for the refined product [loc. cit.].

SEMPIO (C.). **Sulla interpretazione del meccanismo intimo di azione dello zolfo come anticrittogamico.** [On the interpretation of the intimate mechanism of the fungicidal action of sulphur.]—*Mem. Reale Accad. d'Italia, (Roma), Classe di Sci. Fis., Mat., e Naturali*, iii, *Biol.* 2, 30 pp., 1932.

In this further account of his investigations into the mechanism of the fungicidal activity of sulphur [see preceding abstract] the author gives a full description of experiments made to ascertain whether compounds are formed when sulphur is exposed in a thin layer to very different environmental conditions and of tests of the toxicity to the conidia of *Erysiphe graminis* of common ground sulphur and most of its compounds under different conditions. From the results obtained [which are discussed in detail, and with reference to those reached by other workers] the author concludes that elementary sulphur acts by penetrating unchanged into the fungal cells, that this penetration is facilitated by the presence of oxygen, and that once having entered the cells the sulphur kills them, either, as is more probable, directly, and without undergoing chemical change, or indirectly, with the formation of reduction compounds.

An exhaustive bibliography is appended.

[An English translation of this paper has been issued by the Boyce Thompson Institute, Yonkers, New York.]

MARTIN (H.) & SALMON (E. S.). **The fungicidal properties of certain spray-fluids, IX. The fungicidal properties of the products of hydrolysis of sulphur.**—*Journ. Agric. Sci.*, xxii, 3, pp. 595–616, 1932.

Further investigations at the South Eastern Agricultural College,

Wye, Kent, into the fungicidal properties of spray fluids [cf. *R.A.M.*, xi, pp. 253, 464] with special reference to the effect exercised upon the conidia of *Sphaerotheca humuli* by the sulphur compounds likely to be formed by the alkaline hydrolysis of sulphur showed that sodium sulphite, applied with 0·5 per cent. gelatine or 0·5 per cent. agral I as spreader was fungicidal at a content of 0·25 per cent. sulphur but not at 0·16 per cent. At these concentrations the solutions injured the hop leaves.

Calcium bisulphite solutions (1 in 50) with a 0·1 per cent. sulphite sulphur content, applied with 0·5 per cent. gelatine, were non-fungicidal and non-injurious to the leaves.

A suspension of calcium sulphite (5 per cent.) and agral I (0·5 per cent.) was non-fungicidal and non-injurious to the leaves.

Neutralized solutions of 0·3 per cent. hydrosulphite sulphur applied with gelatine or agral I before the disappearance of the reducing properties were fungicidal, but those of 0·15 per cent. were not. Leaf injury appeared to be less severe than with aqueous solutions of sodium metabisulphite, but at the 0·15 per cent. concentration injury was not always prevented by neutralization with calcium hydroxide.

Sodium formaldehydesulphoxylate (1 per cent.) with 0·5 per cent. gelatine and sodium formaldehydesulphite (1 per cent.) were non-fungicidal and highly injurious to the leaves.

Sodium thiosulphate at a concentration of approximately 0·25 per cent. thiosulphate sulphur, applied with agral I, was non-fungicidal and non-injurious.

Calcium thiosulphate solutions containing 0·5 per cent. thiosulphate sulphur and 0·5 per cent. agral I checked the regrowth of the fungus but were ultimately non-fungicidal.

Sodium sulphide solutions containing 0·25 per cent. monosulphide sulphur and 0·5 per cent. soft soap or agral I were fungicidal, but not when they contained only 0·13 per cent. monosulphide sulphur. At both concentrations the leaf tissue under the mildew patches was killed and showed a purplish-brown spotting. At the higher concentration, injury was sometimes produced on the edge of the leaf and on leaves lower down on which the fluid dripped. These solutions liberated hydrogen sulphide (sulphuretted hydrogen) after spraying, and the response of the fungus to this gas could be estimated by comparison of the sprayed leaves with controls treated with equivalent solutions of sodium hydroxide and sodium carbonate. These had the same effect on the mildew as the sodium sulphide solutions, but the leaf tissue appeared to be more severely injured.

Calcium hydrogen sulphide at a concentration of 0·5 per cent. monosulphide sulphur with 0·5 per cent. agral I was non-fungicidal and non-injurious.

Calcium sulphide (sulphurated lime) 5 per cent. with gelatine or agral I was non-fungicidal and non-injurious to the leaves.

Solutions of potassium and sodium polysulphides of equal polysulphide sulphur content had a similar action on the fungus. When solutions of calcium, sodium, and potassium polysulphides of equal polysulphide sulphur content were applied with 0·5 per cent. agral I a more pronounced fungicidal action was noted than

when they were used with 0·5 per cent. gelatine or 0·5 per cent. soft soap.

From these results it is concluded that the fungicidal activity of sulphur in the form of sulphite sulphur, hydrosulphite sulphur, sulphoxylate sulphur, thiosulphate sulphur, or monosulphide sulphur is inadequate to account for the fungicidal properties of finely divided elementary sulphur [see preceding abstracts]. The fungicidal properties of solutions of sodium sulphide, sodium hydroxide, and sodium carbonate result from the alkalinity of the sprays; the hydrogen sulphide liberated from the sodium sulphide solutions used has no effect on *S. humuli.* The active fungicide produced by the hydrolysis of sulphur is sulphur in polysulphide form. That agral I promotes the fungicidal activity of elementary sulphur may, it is considered, be due to its enhancement of the fungicidal action of sulphur in polysulphide form. The direct fungicidal action of polysulphide solutions is due to the polysulphide sulphur as such.

STREETER (L. R.), MADER (E. O.), & KOKOSKI (F. J.). **The adherence of copper dusts to foliage.**—*Phytopath.*, xxii, 7, pp. 645–650, 1 graph, 1932.

Experiments were conducted at Cornell University, New York, to determine the effect of moisture and time of application on the adherence of copper dusts to potato leaves [cf. *R.A.M.*, vi, p. 313]. The preparations, containing 81 parts of hydrated lime and 19 of copper sulphate monohydrate, were applied to both dry and moist foliage on various dates and times of day in July and August.

The results of the tests [which are tabulated] showed that the presence of moisture on the leaves is essential to good adhesion of the copper-lime dust, the adherence of the copper being closely correlated with the presence of dew. The lack of adhesion in the absence of moisture is attributed (on the basis of laboratory tests) to the conversion of calcium hydroxide to calcium carbonate, so that a good adhering film is not formed. The process of conversion may occupy periods ranging from a few hours to several days according to temperature and humidity, but under normal midsummer conditions it is likely to be rapid.

TISDALE (W. H.). **Ethylmercury compounds as agricultural disinfectants.**—*Indus. & Engin. Chem.*, xxiv, 7, pp. 745–747, 2 figs., 1932.

A summary is given of the various agricultural uses to which certain antiseptic ethylmercury compounds have been put of recent years in the United States, e.g., as seed-grain, cotton, and vegetable disinfectants, and in the control of sap stain or blue stain of timber [*R.A.M.*, x, pp. 225, 355, 356, 766; xi, p. 491]. Most of the work described has already been noticed from other sources.

CADORET (A.). **Le pulvérisateur à jet sphérique.** [Spherical spraying nozzle.]—*Prog. Agric. et Vitic.*, xcvii, 25, pp. 604–605, 1 fig., 1932.

The spraying nozzle very briefly described in this paper consists

of a hollow copper sphere provided with one apical and four lateral spraying vents, each giving a fan-shaped jet. This nozzle, which may be adapted to any hand or mechanically driven sprayer, is claimed to be particularly useful for spraying grape bunches hidden among thick foliage, which usually are not reached by sprayings done with the ordinary nozzle now in common use (Riley nozzle) [cf. *R.A.M.*, x, p. 773 ; xi, p. 153]. As recommended by the author, in vineyards where the foliage is dense each spraying should be done in two rounds, the first consisting of the ordinary application of the spray to the foliage, and the second, coming immediately after the first, consisting of the special bunch spraying with the new nozzle which should be thrust into the midst of the stock and kept there from 2 to 3 seconds. The nozzle should also be useful for spraying fruit trees.

GLENNIE (AGNES E.). **Index to the literature of food investigation.**—Published by Dept. Sci. & Indus. Res., Food Invest. Board, London, iii, 1, iv + 167 pp., 1931 ; iii, 2, iv + 183 pp., 1931 ; iv, 1, iv + 135 pp., 1932.

These are three further numbers of the annotated bibliography of current English and foreign publications of interest to those concerned with problems of food research (including spoilage and preservation) which is issued at intervals by the Low Temperature Research Station, Cambridge [cf. *R.A.M.*, x, p. 328]. The first part of volume iv contains a brief review of noteworthy developments in the subject during 1930–1.

KÖCK (G.). **Die Bedeutung der kulturellen Bekämpfungsmethoden im praktischen Pflanzenschutz.** [The importance of cultural control methods in practical plant protection.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xlii, 7–8, pp. 383–389, 1932.

In the writer's opinion, the current tendency in plant protection is to emphasize the chemical methods of control at the expense of cultural and biological practices, e.g., intensive soil cultivation, adjustment of harvesting time, crop rotation, and manuring, some general observations on which are made with a view to their wider adoption.

RIVERS (T. M.). **The nature of viruses.**—*Physiol. Reviews (Amer. Physiol. Soc.)*, xii, 3, pp. 423–452, 4 diags., 1932.

This is a survey of recent literature on various aspects of the virus problem, including dimensions, purification, cultivation, metabolism, and adaptation of the viruses, inclusions, the viruses as filterable forms of bacteria, the effect of physical and chemical agents on viruses, spontaneous generation of viruses, immunity, and concepts of the nature of viruses. In the author's opinion, the nature of these active agents cannot be definitely determined in the present confused state of knowledge, though the simplest explanation, based on presumptive evidence, is that they are infinitely small living organisms.

MacClement (D.) & Smith (J. H.). **Filtration of plant viruses.**—*Nature*, cxxx, 3273, pp. 129–130, 1932.

The writers have examined the filterability of a number of plant juices containing viruses by means of graded collodion membranes prepared according to the technique of W. J. Elford. It was found that there was a rapid clogging of the pores, especially of the finer membranes, notwithstanding thorough preliminary clarification by passage first through paper pulp and then through a coarse membrane (0·6 or 0·7 μ). With some plants, e.g., tomatoes of more than a few weeks old, this plugging renders the results useless as a guide to the size of the particles, but in others, e.g., tobacco, this drawback is less pronounced. Possibly this accounts for the fact that the virus does not pass undiminished in quantity through the series of membranes down to a definite pore size, but undergoes a progressive reduction all the way down. For instance, the number of spots developing on *N[icotiana] glutinosa* leaves after passage of paper pulp was 407 per leaf; after 0·8 μ 220, after 0·49 μ 38, after 0·25 μ 6, and after 0·1 μ or less no spots occurred. Experiments are in progress for the removal of the clogging material before passage of the membranes.

As in the case of animal viruses, those of plants were found to differ greatly in size. The tobacco mosaic virus (Johnson No. 1) [*R.A.M.*, x, p. 60] passes the 0·051 μ membrane, though in reduced quantity (only four out of eight plants infected), and the 0·154 μ easily. The yellow tobacco mosaic virus (No. 6) is of the same size, passing 0·051 μ (two plants positive out of eight). Aucuba mosaic virus passes 0·120 and 0·112 but not 0·10, 0·06, or 0·051 μ. The virus of a *Hyoscyamus* disease found by Dr. Marion Hamilton passes 0·30 but not 0·234 μ or smaller—a point of some interest as this virus has been shown not to traverse an L. 3 Pasteur-Chamberland porcelain candle, although its pore size is about 2·5 μ.

By Elford's method of calculation, these figures would indicate a particle size of 15 $\mu\mu$ for the tobacco and yellow mosaic viruses, about 40 to 50 $\mu\mu$ for aucuba, and 150 $\mu\mu$ for the *Hyoscyamus* virus. The value found for tobacco mosaic thus comes midway between Duggar's estimate of 30 to 40 $\mu\mu$ and that of Waugh and Vinson (5 $\mu\mu$) [ibid., xi, p. 407].

By the use of these membranes it is possible to separate two viruses occurring together in nature in the same plant. The *Hyoscyamus* virus was passed through a series of membranes, traversing 0·64 and 0·30 μ with characters unchanged; after passage through 0·234, 0·209, and 0·120 μ the disease produced was of a different type. Further investigations showed that the virus passing the smaller membranes is entirely distinct in its properties from the other larger one it accompanied, and that the two may be separated by other methods than filtration.

Labrousse (F.). **Les caractéristiques biochimiques des micro-organismes suivant la composition du milieu.** [The biochemical characteristics of micro-organisms according to the composition of the medium.]—11 pp., Paris, Éditions de la Revue de Pathologie Comparée et d'Hygiène Générale, 1932.

The author's investigations into the biochemical properties shown

by very numerous [unspecified] species of fungi in culture [*R.A.M.*, ix, p. 549] demonstrated that with certain fungi the change effected in the P_H value of the medium by the presence of the organism is conditioned by the nature of the nitrogenous salt present in the medium and may take place in the absence of any fungal development, so that it is evidently independent of metabolism. With other fungi, however, the P_H value of the medium never changes until fungal growth has actually begun, and in this case the change always consists in an acidification of the medium; it is conditioned by the same factors as is the fungal growth, and with any given fungus the P_H value set up varies according to the nature of the carbohydrate present in the medium. Any particular species of fungus belonging to either of the preceding classes will, on any given medium, set up a reaction corresponding to a P_H value characteristic of the species.

None of the fungi which oxidized guaiacol reduced the other indicators, and none which possessed reducing properties oxidized guaiacol [loc. cit.]. Any given fungus was able to reduce only a certain number of indicators whose oxidation-reduction potentials were not below a certain value. As a given series of colouring agents became increasingly difficult of reduction by any given fungus, so they showed a corresponding decrease in oxidation-reduction potentials. All the fungi possessed of reducing properties were able to reduce cresyl blue; this means that an oxidation-reduction potential of +0·033 volts was set up in the medium. A certain number of fungi reduced neutral red, which implies an oxidation-reduction potential of −0·32 volts.

The author considers that these oxidation-reducing properties result from the production at the expense of the constituents of the medium of certain substances possessed of oxidation-reducing properties towards the indicators. These properties become evident only when fungal growth actually begins, and therefore they cannot be explained on any basis of 'activation phenomena' of the type that Quastel suggested in the case of the non-proliferating bacteria. The precise mechanism involved is being investigated by exact analysis of the substances produced in the media during fungal growth.

Proceeding along these lines the author has succeeded in sketching out the physiological characterization of the species concerned. The value of this was seen in the identification of a *Sclerotinia* through its reducing properties [ibid., x, p. 286].

The very low oxidation-reduction potentials set up in the media in which certain fungi were grown explains why anaerobic bacteria find a very favourable environment in the presence of such fungi.

RABINOVITZ-SERENI (D.). **L'azione dei raggi luminosi visibili di differente lunghezza d'onda sull'accrescimento, sulla sporificazione e sulla pigmentazione dei funghi in coltura pura.** [The action of luminous visible rays of different wave-lengths on the growth, sporulation, and pigmentation of fungi in pure culture.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 1, pp. 81–114, 3 figs., 1932.

Experiments [which are described] in which pure cultures in

Erlenmeyer flasks of *Phytophthora cambivora, Epicoccum purpurascens* [*R.A.M.*, xi, p. 638], a *Fusarium* isolated from clover roots, *F. poae, Cladosporium herbarum, Helminthosporium gibberosporum, Sterigmatocystis nigra* [*Aspergillus niger*], *Penicillium crustaceum, Clonostachys araucaria,* and *Botrytis cinerea* in various stages of development were exposed to the effects of luminous radiation showed that, with the exception of the clover *Fusarium*, white daylight and incandescent electric light stimulated mycelial growth, sporulation, and the formation of pigment. Red light depressed growth [cf. ibid., xi, p. 564], cultures exposed to it behaving as in the dark, the more sharply refracting rays of the spectrum being absent from the red end of the spectrum. The fungi were not markedly sensitive to the various forms of visible luminous radiation tested (the different colours being obtained by placing the cultures in wooden boxes provided with coloured glass windows), and the stimulatory effect of the more sharply refracting radiations was not distinctly specific. *C. herbarum*, both species of *Fusarium, H. gibberosporum*, and *A. niger* remained almost unaffected.

The more sharply refracting rays exercised a specific action on the formation of pigment in those fungi which contained a chromogenous group in the constituents of their cellular content. Yellow and red rays had no inhibiting or retarding influence, the lack of any formation of pigment in the fungi when exposed to them being due solely to the absence of actinic rays just as occurs in the dark. The very slight formation of pigment which, exceptionally, occurred even in darkness showed that the process of oxidation, to which the appearance of the pigment is due, may sometimes take place very weakly even in the absence of the more refracting rays which normally provoke and accelerate the process.

Like the other fungi tested, *B. cinerea* sporulated when exposed to any of the visible luminous rays, but complete absence of light inhibited (completely or nearly so) conidial production. Blue rays had the greatest stimulatory effect on the growth and spore production of *B. cinerea*. In some fungi, e.g., *H. gibberosporum*, luminous radiation slightly reduced spore production.

RABINOVITZ-SERENI (D.). **Il grado di resistenza di alcuni funghi all'azione dei raggi ultravioletti.** [The degree of resistance of certain fungi to the action of ultra-violet rays.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 1, pp. 115–144, 5 figs., 1932.

When the conidia of 22 species of fungi were exposed at a distance of 20 cm. to the ultra-violet rays emitted by a quartz-mercury vapour lamp (110 volts, 5 ampères) [cf. *R.A.M.*, xi, p. 166] they exhibited very different powers of resistance, depending on the thickness and colour of the walls and the nature of the cytoplasm; in some instances the resistance appeared to correspond to an adaptation to new conditions of habitat.

Dark, thick-walled conidia, such as those of *Helminthosporium gibberosporum, Coniosporium bambusae,* and *Epicoccum purpurascens* resisted the effects of exposure for 180 minutes; slightly olivaceous conidia, such as those of *Microascus stysanus* and *Penicillium crustaceum* withstood exposure for 25 minutes, while

hyaline conidia, such as those of *Clonostachys araucaria*, *Fusarium martii*, and the pycnospores of *Deuterophoma tracheiphila* withstood exposure for only 10 minutes.

The percentage of spores that germinated declined as the exposure was prolonged. The most resistant species tested, *H. gibberosporum*, *C. bambusae*, and *E. purpurascens* still germinated normally after 20 minutes' exposure, but after 22 minutes germination fell to 80 per cent., after 90 minutes it fell to 20 to 40 per cent., and after 185 minutes it was only 1 or 2 per cent.

A bibliography of 27 titles is appended.

MURPHY (P. A.). **A critical review of some recent work on the occurrence of virus complexes in the Potato.**—*Scient. Proc. Roy. Dublin Soc.*, xx (N.S.), 18, pp. 193–210, 1932.

This is a critical discussion of K. M. Smith's recent discovery of the x and y viruses associated with certain potato diseases of the mosaic group [*R.A.M.*, x, p. 615; xi, p. 394]. While acknowledging the fundamental importance of this discovery, it is argued that the idea developed by Smith that most potato virus diseases are of dual nature (but admitting the possibility of the existence of a third virus in crinkle and streak), and that their constituents are the same throughout, namely, the y virus which is stable, and the x virus which is variable, is not entirely supported either by his own experimental results, or by the author's work in collaboration with M'Kay, or by Salaman's investigations. In the case of the y virus (with which this paper is exclusively concerned), it is pointed out that in Smith's experiments his y virus separated from Up-to-Date streak and from crinkle in Myatt's Ashleaf differed from the corresponding virus isolated from a mild mosaic in Arran Victory in the severity of the symptoms caused by it in President potatoes after passage through tobacco [loc. cit.]; this fact leads to the conclusion that Smith's view that the y virus is identical in all these three diseases is incorrect and that the virus originating from mild mosaic is not identical with the corresponding viruses from streak and the crinkle, while the identity with each other of the two last-named entities is still open to question. The explanation of this discrepancy may lie either in the fact that the viruses designated y from the mild mosaic in Arran Victory and the Up-to-Date streak, respectively, are entirely dissimilar, or that, while they contain a common element, one or other is itself a complex. Evidence is also adduced to show that Smith's analysis of the Up-to-Date streak by passage through tobacco was not primarily concerned with streak, but with a mosaic which is generally (but, as it is believed, not always) associated with it in this variety, and from which the x and y were in part, at least, derived; in other words, the analysis was concerned with $x+y+Z$ (it is pointed out that this paper was prepared before the publication of Salaman's recent communication [ibid., xi, p. 594], and that the Z used here is merely a designation of a hypothetical virus), and the characteristics given were probably those of $y+Z$. A similar explanation is offered for the fact that the y virus from the form of crinkle in Myatt's Ashleaf used by Smith had a more severe effect on President potato than the y from Arran Victory mild mosaic. The

crinkle material used by Smith does not appear to have been standard crinkle [see next abstract], and can hardly have been fully identical with the crinkle used by the author [cf. ibid., i, p. 250] and Salaman ('crinkle A') [ibid., ix, p. 603]. This consideration deprives the question of the presence in crinkle of a necrotic *y* virus common to Up-to-Date streak of much of its interest, the more so that the weight of evidence adduced by the author is opposed to the view that this streak has any part in the constitution of standard crinkle.

Attention is drawn to the dangers, as illustrated by this critical review, inherent in attempts to determine the constitution of virus complexes by analysis, since it does not distinguish between a virus present in or with a complex, which is only an accidental or latent superfluity, and a virus which is essential for the production of the symptoms characteristic of the complex. If analysis is made, it must be confirmed by synthesis of the given complex, with the production in the original host, by means of a combination of the smallest possible number of viruses, of a disease recognizably similar to the original complex, and with the same transmissibility and other characteristics. It is pointed out, further, that while tobacco possesses certain advantages for the study of potato viruses, too great a reliance on it, to the neglect of other indicator plants, is likely to lead to confusion, a serious objection being the unexplained changes which certain of the potato viruses or complexes appear to undergo when inoculated into it, and which appear to render it impossible to reconstitute the original potato disease with them.

With regard to Salaman's crinkle A the author goes on to show that the simple or interveinal mosaic secured by Salaman by means of certain methods of inoculation corresponds to simple mosaic, and that his results are readily explicable on the ground that the crinkle is a complex of this disease and another virosis, there being no necessity to invoke the theory of modification of crinkle by dosage.

In a brief reference to the American potato virus diseases [ibid., x, p. 682], it is stated that the viruses present in 'healthy' American potatoes include those of simple mosaic, which apparently has not been described in America, and of streak as in Up-to-Date. American mild mosaic is not identical with simple mosaic, and is more like crinkle. The identity of rugose mosaic with crinkle is uncertain.

MURPHY (P. A.) & M'KAY (R.). **The compound nature of crinkle, and its production by means of a mixture of viruses.**—*Scient. Proc. Roy. Dublin Soc.*, xx (N.S.), 20, pp. 227–247, 3 pl., 1932.

This is a detailed account of experiments, repeated three times in different years, the results of which are interpreted as demonstrating the compound nature of the potato crinkle disease [*R.A.M.*, i, p. 250 and preceding abstract]. The material primarily used in the work consisted in an apparently healthy line of the Irish Chieftain variety, which, however, in the very early stages of growth showed faintly visible signs of mosaic and which by grafting transmitted a very faint, but usually recognizable, mosaic

to President and Arran Victory plants. This disease in Irish Chieftain does not appear to have been previously described and, for the sake of convenience, is provisionally termed 'disease A', and the corresponding virus is designated 'virus A' until its constitution and relationships have been more exactly determined. When simple mosaic was introduced into Irish Chieftain naturally infected with this disease, symptoms indistinguishable from crinkle and quite unlike the ordinary simple mosaic were produced, and these symptoms persisted unchanged for at least two or three seasons. When transferred to President this crinkle-like disease again reproduced all the symptoms of crinkle in the majority of cases, but in others a mild mosaic alone resulted, presumably owing to the dropping of one of the constituents in transmission. The crinkle symptoms in President persisted unchanged for at least three seasons. In a few exceptional cases a disease (which has been designated 'sub-crinkle') intermediate between crinkle and simple mosaic was produced in President, indicating that one or more of the viruses that go to make up crinkle is capable of further analysis, and that such an intermediate disease may be the result of the elimination of one of the constituents.

When virus A was introduced into healthy President, after which the plant was inoculated with simple mosaic, typical and persistent crinkle symptoms again developed in most cases and a faint mosaic in others. On inoculation into Up-to-Date plants, the synthetic crinkle produced by the two methods described above gave rise to the typical and fatal effects of natural crinkle.

A combination of virus A and interveinal mosaic produced an aberrant form of crinkle, which may be considered as a variety of this disease. Evidence is adduced to show that the production of a crinkle-like disease when streak from Up-to-Date was combined with virus A was due to a simple mosaic occurring as an impurity in the streak material [loc. cit.], and that this streak has no part in the constitution of crinkle. There was also some evidence that varieties of crinkle corresponding to the artificial combinations described in this paper may occur in nature, and it is pointed out that the disease produced by the combination of standard simple mosaic from Arran Victory with disease A corresponded most closely with standard crinkle as it occurs naturally in Irish Chieftain and other varieties.

The paper terminates with a preliminary discussion of some of the characteristics of the A disease, and of its practical importance.

SALAMAN (R. N.) & BAWDEN (F. C.). **An analysis of some necrotic diseases of the Potato.**—*Proc. Roy. Soc. London*, Ser. B., cxi, B769, pp. 53–73, 2 pl., 1932.

A summarized review of the literature dealing with the group of potato virus diseases to which the term 'streak' has been applied, makes it appear that it may be distinguished into two clearly differentiated clinical states. For the first of these the authors accept Quanjer's designation acropetal necrosis [*R.A.M.*, x, p. 746], synonymous with stipple streak or leaf drop streak; and

for the second, the term acronecrotic necrosis, corresponding to Quanjer's acronecrosis or top necrosis [loc. cit.] and to the streak of some older writers. It is pointed out, however, that these names should only be taken as applying to distinct clinical pictures, and should not imply reactions of specific virus units.

Their investigation of this group of diseases is claimed by the authors to have shown that acropetal necrosis is the distinctive reaction in certain potato varieties of K. M. Smith's *y* virus [see preceding abstracts] and is transmissible both by inoculation and by grafting as well as by aphids. The acronecrotic necroses may be separated into at least four groups on the ground of their varietal reaction; these groups are respectively designated as top necrosis X, top necrosis A, top necrosis B, and top necrosis C. The first three have the common feature that when they produce a top necrosis in any given variety, it is not accompanied by any mosaic symptom, while the last-named differs clinically in that necrotic and mosaic symptoms occur together. Top necrosis X was shown to be caused by the *x* virus acting alone, top necrosis A to be due to a complex containing both *x* and *y*, the *z* virus [ibid., xi, p. 594] being suspected to be also present, top necrosis B to a complex containing *z* and *y*, and top necrosis C to the presence of the *x* and *y* viruses without any evidence of the presence of *z*. The X and C complexes are transmissible by needle inoculation to other potato varieties, the resulting lesion not being necessarily a top necrosis. The B complex is uninoculable by the sap, as is also the A complex, except that the latter can be conveyed to the Arran Crest and Epicure varieties by the needle.

Top necrosis A was found to be carried in a latent condition by certain plants of many of the most widely grown potato varieties in England, such as Arran Banner, Majestic, and Up-to-Date; the last-named, indeed, is rarely to be found without such latent infection. So far the variety Di Vernon alone was found to carry the top necrosis B in the field.

The work is also claimed to have demonstrated that a clinical disease of the mosaic group cannot be defined by the syndrome of its reaction in one particular variety of the potato, but rather by the complete history of the various symptoms caused by it in a large number of varieties, as well as in a certain number of selected species of non-related Solanaceae. It is considered that the aim to be pursued in the study and classification of plant virus diseases should be to find a correct formula in terms of the virus entities concerned for each clinical disease.

BAWDEN (F. C.). **A study on the histological changes resulting from certain virus infections of the Potato.**—*Proc. Roy. Soc. London*, Ser. B., cxi, B769, pp. 74–85, 3 pl., 1932.

As a result of his investigation of the morbid anatomy of potato plants infected with certain virus diseases, the author describes three distinct types of necrosis, each correlated with a definite set of external symptoms [details of which are also given], namely, acronecrosis and acropetal necrosis [see preceding abstract] and leaf roll (Quanjer's phloem necrosis) [*R.A.M.*, x, p. 746]. In acronecrosis, which externally is characterized by a necrotic spotting

of the uppermost leaves followed by a dying of the plant from the top downwards, in the absence of any mottling, necrotic areas were invariably found in the stem. These necroses, which are most severe in the distal portions, originate usually, but not always, in the internal phloem and spread into the surrounding tissues, the first symptom being a thickening of the cell walls of the primary phloem elements, accompanied by a separation of the walls; the intercellular spaces thus formed are filled with a yellowish-brown gum-like deposit. The necrotic process is similar but more pronounced in the phloem parenchyma, frequently causing the complete obliteration of the sieve tubes and the collapse of the companion cells. The cytoplasm may disappear altogether or it may turn into a plastic mass with the same characteristics as the intercellular gum. The necrosis also spreads to the wood parenchyma, which is particularly susceptible to it, the xylem vessels being involved in severe cases. The necrotic process may also originate, though less frequently, in the outer phloem. Necroses, similar in their origin and appearance to those in the stem, are also found in the petioles; frequently they are particularly severe and lead to the death of the corresponding leaf, and the axillary buds also become affected and are ultimately killed. When present in the tubers, the necroses develop essentially in the same manner as those in the stem, and rapidly spread to the storage parenchyma. Cork layers abstricting the necrotic areas are always formed in affected tubers, and are occasionally produced in stems grown at high temperatures.

In acropetal necrosis, the external symptoms of which are a crinkling of the upper leaves and drooping of the lower leaves which remain hanging to the stem, internal necroses are seen in the stem and petioles, and chiefly affect the collenchyma, the vascular tissues remaining normal.

Necroses restricted to the phloem elements and consisting in lignification are produced in plants suffering from leaf roll in the year following that of infection. In no cases were necroses found in the stems or petioles of virus-free potato plants.

VERPLANCKE (G.). **Étude histologique et cytologique des parties aériennes de la Pomme de terre atteinte de 'spindle tuber'.** [An histological and cytological study of the aerial parts of the Potato attacked by spindle tuber.]—*Bull. Soc. Roy. Bot. de Belg.*, lxiv (Sér. II, xiv), 1, pp. 128–176, 3 pl., 1931.

Continuing his earlier investigations into spindle tuber of potatoes in the United States [*R.A.M.*, x, p. 814] the author describes further studies in Maine [which are described and the results of which are tabulated and discussed] to determine whether the cytological and histological changes observed in the tubers [loc. cit.] also affected the other parts of the plant. He found that in all the varieties tested, viz., Green Mountain, Irish Cobbler, Bliss Triumph, and Russet Burbank the disease did in fact modify most of the elements of the tissues of the aerial parts. There was an extension in the length or reduction in the width of the cells, or both took place at the same time, but almost always the length to

breadth ratio was increased. This final elongation was noted especially in the elements of the conducting system.

FERNOW (K. H.) & BLACK (L. M.). **Yellow dwarf in New York State.**—*Amer. Potato Journ.*, ix, 7, pp. 116–117, 1932.

Yellow dwarf of potatoes has been known to occur in New York State since 1917, but not until 1929 did the disease become an important factor in the fields under inspection for seed purposes. Since that date there has been a steady increase in the incidence of yellow dwarf both in seed and table stock. Samples of certified seed, each consisting of 100 tubers, planted at Ithaca in 1929 showed 3 per cent. infection, the corresponding figures for 1930 and 1931 being 9 and 22 per cent., respectively. The outbreaks appear to have been correlated with the high temperature and dry weather prevailing during the two latter seasons. The Green Mountain variety appears to be more susceptible to yellow dwarf than Rural. The disease has recently been experimentally transmitted in the field by stem-grafting. Other States in which yellow dwarf is known to occur include Vermont, Pennsylvania, Minnesota, Michigan, Florida, and New Jersey.

KOSMAT (H.). **Abbau der Kartoffel und Saugkraft.** [Potato degeneration and osmotic capacity.]—*Fortschr. der Landw.*, vii, 15, pp. 395–397, 2 graphs, 1932.

After a brief review of previous investigations on the correlation between potato degeneration and osmotic capacity, the writer describes his laboratory experiments at Vienna with the first and third progenies of Böhm's Allerfrüheste Gelbe and the first and second of Ebstorfer Juliperle from a neighbouring district where deterioration is prevalent.

The tubers were received on 7th November, 1930, and kept until the end of the following February in diffused light at ordinary room temperature. On examination it was found that the second progeny of Ebstorfer Juliperle tended to degenerate, yielding only 81 per cent. of the yield from the first; its osmotic index was 23 as compared with 44 for the first. On the other hand, the first progeny of Böhm's Allerfrüheste Gelbe showed a lesser osmotic index (40) and a lower yield (100) as compared with the third (50·5 and 113, respectively).

GARBOWSKI (L.) & LESZCZENKO (P.). **Sprawdzanie odporności Ziemniaków na raka zemniaczanego, Synchytrium endobioticum (Schilb.) Perc. Sprawozdanie II.** [Potato tests for resistance to wart disease, *Synchytrium endobioticum* (Schilb). Perc. Second report.]—*Prace Wydz. Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Sect. State Inst. Agric. Sci. in Bydgoszcz*], 11, pp. 51–76, 1932. [French summary.]

This is a summarized account of the authors' laboratory and field tests in 1930 and 1931 of 93 named potato varieties for resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, ix, p. 802], the later part of the laboratory trials being made by their

improved method of sprout infection with summer sporangia [ibid., x, p. 619]. Of the varieties tested six, namely, Jubel, Lech, Magdalenki, Parnassia, Pepo, and Rosafolia, did not show any signs of infection either in the field or in the laboratory, and are classed as entirely immune from the disease. Nine, namely, Arnika, Erdgold, Hindenburg, Juli, Favorit, Prezydent Narutowicz, Wita, Włoszanowskie No. 12 and Włoszanowskie No. 112, escaped infection in the field but in the laboratory showed a transient form of infection which did not lead, however, to the formation of warts or of winter sporangia in the tubers; for all practical purposes such varieties may also be considered as immune, and their cultivation may be permitted in areas threatened with wart disease, as presenting no danger of soil infection. All the remainder exhibited varying degrees of well-defined susceptibility, but four, namely, Borys, Kuckuck, Lucja, and Topaz showed very faint symptoms of the disease in the field, which might easily have been overlooked in a superficial survey, while they were quite severely attacked in the laboratory tests. The case of these four varieties strikingly illustrates the necessity of checking the results of field trials by the more severe laboratory tests, and also the danger of relying on field tests alone in the approbation of potato varieties as wart-resistant.

[These results are also reported in *Bull, Internat. Inst. Plant Protect.*, vi, 8, pp. 131–132, 1932.]

SHARPLES (A.). **Diseases of Rubber.**—*Malayan Agric. Journ.*, xx, 5, pp. 223–229, 1932.

Brief, popular notes are given of investigations in progress in 1931 on the following diseases of *Hevea* rubber in Malaya, viz., wet root rot (*Ganoderma pseudoferreum*) [*R.A.M.*, xi, pp. 324, 402], the root disease due to *Fomes lignosus* [ibid., ix, p. 740], and mouldy root rot of the tapping panel (*Sphaeronema fimbriatum*) [*Ceratostomella fimbriata*: ibid., x, p. 549]; the only other disease of first-rate importance, *Oidium heveae* [ibid., xi, pp. 401, 469], did not develop in 1931, as the weather conditions did not favour infection. During the first half of the year pink disease [*Corticium salmonicolor*] was troublesome in some parts of North Perak and Kedah.

OGILVIE (L.). **Observations on Hop diseases in Herefordshire and Worcestershire with suggestions for their control.**—*Ann. Rept. Agric. & Hortic. Res. Stat. Long Ashton, Bristol, for 1931*, pp. 139–142, [1932].

As no case of recovery from nettlehead of hops [cf. *R.A.M.*, x, p. 207] has been observed in Worcestershire, growers are advised to grub up the affected plants, this being the only means of eliminating the disease. Attempts to transmit nettlehead by means of the aphis *Phorodon humuli* were unsuccessful. Split leaf [ibid., ix, p. 15], also mainly confined to the Fuggles variety, is extending in the west of England. It spreads in the same way as nettlehead and is probably due to a virus. The plants recover, but never completely, towards the end of the growing period. Persistent roguing is the only way to control the condition.

Brief notes are also given on downy mildew [*Pseudoperono-*

spora humuli], chlorotic disease [ibid., xi, p. 539], and mosaic [ibid., xi, p. 423] of hops.

ATANASOFF (D.), DODOFF (D. N.), KOVAČEVSKI (I. C.), MARTINOFF (S. I.), TRIFONOVA (Mme V.), & CHRISTOFF (A.). Нови паразитни гжби за България. III Приносъ. [Parasitic fungi new to Bulgaria. Third contribution.]—*Yearbook Univ. of Sofia, Fac. of Agric.*, Sofia, x, pp. 341–366, 1932. [English summary.]

In this further annotated list of plant-parasitic micro-organisms stated to be new records for Bulgaria [*R.A.M.*, x, p. 436] the following organisms of economic interest may be mentioned. *Bacillus* (*Erwinia*) *papaveri* Christoff n. sp. was found attacking all the organs of the opium poppy (*Papaver somniferum*), on which it caused brown to blackish-brown spots, and of *P. alpinum* and *P. orientale* on which the lesions had a purplish tinge. The bacillus is a short to moderately long (1 to 3·3 by 0·4 to 0·6 μ), motile, strictly aerobic, gram-negative, non acid-fast, non-sporulating, capsulate rod with rounded ends and with 1 to 10 peritrichial flagella, occurring usually singly but frequently in pairs and rarely in chains. It grew well on all the usual bacteriological media, its optimum temperature for growth being 29° C. with a maximum at 36°. On potato agar it formed hyaline, smooth, slightly raised, round colonies with entire or slightly wavy margins; it coagulates milk, liquefies gelatine, does not hydrolyse starch, forms acids from dextrose and saccharose and basic substances from lactose and glycerine, but does not produce indol or gases, except for faint traces of ammonia. On poppy seeds it was shown to retain its viability for over 20 months. *Bacterium maculicola* [ibid., x, p. 62] was observed forming necrotic spots on the leaves, stems, and the heads of cauliflowers; a study is in progress to determine the real identity of the causal organism.

The other records include *Bact. medicaginis* var. *phaseolicola* [ibid., xi, p. 618] on French beans (*Phaseolus vulgaris*) grown from seed imported from Germany; *Urocystis cepulae* on onion [ibid., x, p. 499]; *U. tritici* on wheat [ibid., x, p. 782]; *Puccinia pruni-spinosae* [ibid., xi, p. 559] in the aecidial stage on *Anemone ranunculoides* and in the uredo- and teleutospore stages on different species of *Prunus*, including plum; *Microstroma album* [ibid., vii, p. 407; x, p. 494] on oak (*Quercus pedunculata*); *Phyllosticta antirrhini* on *Antirrhinum majus* [ibid., vii, p. 723]; *P. cannabis* on hemp (*Cannabis sativa*); *Macrophoma straminella* on rhubarb; *Cytospora capitata* [ibid., v, p. 747] on dead apple buds and twigs; *C. leucostoma* var. *cincta* [ibid., iii, p. 433; v, p. 342] causing the death of peach twigs; *Septoria cucurbitacearum* [ibid, x, p. 296] on vegetable marrow; *S. passerini* [ibid., viii, p. 422] on barley and some wild species of *Hordeum*; *S. tritici* [ibid., x, p. 84], very widespread on wheat, rye, and *Poa pratensis*; *Verticillium albo-atrum* on *Acer negundo*, eggplant, *Capsicum annuum*, tomato, plum, peach, apple, and cotton; *Ramularia cynarae* [ibid., vii, p. 556] on globe artichokes (*Cynara scolymus*); *Fusarium culmorum* [ibid., xi, p. 632] on wheat, tobacco, rice, and French beans; and *F. arthrosporioides* [ibid., iii, p. 202 and above,

p. 709] on rice. The paper terminates with a list of new host plants of parasitic fungi that were recently found in Bulgaria.

HOPKINS (J. C. F.). **A list of plant diseases occurring in Southern Rhodesia. Supplement 2.**—*Rhodesia Agric. Journ.*, xxix, 6, pp. 462–467, 1932.

This further list of some 90 plant diseases (mainly caused by fungi but a few physiological) occurring in Southern Rhodesia [*R.A.M.*, xi, p. 25] includes those that were recorded there from June 1931 to May 1932, and also several fungi that were collected prior to 1926.

MUSKETT (A. E.), CARROTHERS (E. N.), & CAIRNS (H.). **Contributions to the fungus flora of Ulster.**—*Proc. Roy. Irish Acad.*, Sect. B., xl, 2, pp. 37–55, 1932.

This is a list, arranged in systematic order, of 311 species and nine varieties of fungi which are stated to be new records for Ulster, 76 species and one variety of which are new to the fungus flora of Ireland. The hosts and localities are indicated in each case.

ARTHUR (J. C.). **Terminologie der Uredinales.** [Terminology of the Uredinales.]—*Ber. Deutsch. Bot. Gesellsch.*, l *a* (*Festschr.*), pp. 24–27, 1932.

Commenting on Cunningham's proposed modifications in the terminology of the Uredinales [*R.A.M.*, x, p. 543], the author finds that these do not fulfil the essential requirements of morphological exactitude and lucidity. It is recommended that the terminology suggested by the writer in 1905 (*Bot. Gaz.*, xxxix, p. 219) be retained, with the exception of the term 'uredinium', for which 'uredium' may be substituted. This recommendation, first made in 1931, has been adopted by Clements and Shear in 'The Genera of Fungi'.

SHEN (C. I.). **Species of Pestalozzia and Monochaetia in China. I.**—*Contrib. Biol. Lab. Sci. Soc. China, Bot. Ser.*, vii, 5, pp. 131–141, 2 figs., 1932.

An annotated list is given of eight species and one variety of *Pestalozzia* and two of *Monochaetia* hitherto collected in China. A key to the species is furnished and the spores of each are figured. *P. sinensis* n. sp. is reported on living leaves of *Ginkgo biloba*, *P. gossypii* Hori on living leaves of cotton, and *P. congensis* P. Henn. in round spots on loquat (*Eriobotrya japonica*) leaves.

CURZI (M.). **Studî su lo 'Sclerotium rolfsii'.** [Studies on *Sclerotium rolfsii*.]—*Boll. R. Staz. Pat. Veg.*, N.S., xi, 4, pp. 306–373, 9 pl., 19 figs., 3 graphs, 1 chart, 1932.

In this paper a detailed account is given of a comparative study of two strains of *Sclerotium* isolated, respectively, from China aster (*Aster* [*Callistephus*] *chinensis*) and potato in Italy. On their natural hosts both fungi appeared to be referable to *S. rolfsii*

Sacc. and could scarcely even be regarded as separate strains, but in culture they invariably remained distinct.

The aster strain developed a flocculent, abundantly aerial mycelium with numerous sclerotia which were globose, or often flat or slightly concave (very seldom perfectly spherical), varying from 0·5 to over 3 mm. in diameter, and from chestnut or fuliginous to Isabella or dark grey in colour. When the sclerotia were densely grouped large drops of liquid exuded from them and tinged the mycelium. Stromata were rare and only formed on potato glucose agar at 12° to 15° C. The basidial stage [*R.A.M.*, xi, p. 405] was white, flocculent, aerial, and fugacious. The clavate basidia bore 2 to 4 sterigmata measuring 4 to 5 μ in length, at the tip of which the smooth, hyaline, oval-piriform basidiospores, 5 to 7·5 by 2·5 to 3·75 μ in diameter, arose.

The mycelium of the potato strain was never flocculent, but usually arranged in strands. The numerous sclerotia were almost constant in shape and size (small and almost perfectly spherical) on all media and their colour ranged from brick-red to chestnut. The exuded liquid was almost colourless. The numerous stromata were white or ochraceous, sparse or aggregated in irregular masses. The basidial stage formed a crust-like hymenium. The basidia were clavate, and the smooth, hyaline, globose-piriform basidiospores measured 4·5 to 6·75 by 3·5 to 4·5 μ.

In the aster strain the basidia were free, long, and raised, whereas in the potato strain they were short and thick, forming crusts 50 to 250 μ thick, irregular in shape and measuring up to 15 mm. or more in diameter. The sterigmata of the potato strain were slightly shorter than those of the aster strain. The latter, besides showing more variation in its characters, also saltated more frequently. The variants were quite distinct, having a less abundant aerial mycelium than the parent strain and more regular sclerotia. The variants of the potato organism did not differ materially from the parent, and generally showed a more abundant aerial mycelium, with fewer sclerotia.

When the glucose content of the medium was increased, the sclerotia of the potato strain became proportionately more numerous, but retained their shape and size, whereas those of the aster strain tended to become fewer but larger and to become massed together, while their shape also became increasingly irregular.

The aster and potato organisms were mutually antagonistic, the former inhibiting the growth of the latter while it also developed more sclerotia and more basidial fructifications in the line of demarcation. The antagonistic effect of the aster strain was also exerted on certain foreign strains received by the author as *S. rolfsii* and *S. delphinii*, though no such effect was exercised on *Corticium centrifugum* [ibid., xi, p. 539], received from Japan, and only a very slight one on a strain of *S. rolfsii* from Alabama and another from Illinois. All these foreign strains had many vegetative characters of the mycelium and sclerotium in common with the Italian aster strain.

In ordinary media rich in nutrients and at an air temperature of 15° to 25° the basidial stage appeared after about a month in the aster strain, the hymenial plaques of the potato strain forming

15 to 30 days later. In media poor in nutrients abundant sporulation took place after 10 to 15 days at 27° to 28°, in the potato strain only.

The author concludes that his potato strain corresponds with that from which Saccardo described *S. rolfsii*; it cannot be identified with any known Basidiomycete and is accordingly named *C. rolfsii* n. comb., as its sterile form corresponds to the original *S. rolfsii*. *C. centrifugum* cannot be regarded as the perfect stage of the true *S. rolfsii*. The aster strain differs from Saccardo's original *S. rolfsii* and from *S. delphinii*, but is very close to Wolf's and Stevens's strains of *S. rolfsii* [cf. ibid., x, p. 693], and should probably be considered as specifically identical with them, and distinct from the typical *S. rolfsii* and *S. delphinii*; it shows many affinities with *C. centrifugum* and other fungi of the same group.

The name *S. rolfsii* is thought to include more than one *Sclerotium* whose systematic position should be cleared up by a search for the perfect stage or an accurate study of the vegetative organs under various environmental conditions. Such a study should be based on the characters of the mycelium rather than on those of the sclerotia, as has been the case hitherto.

CURZI (M.). **Contributo alla conoscenza della biologia e della sistematica degli stipiti dello 'Sclerotium rolfsii'.** [A contribution to the knowledge of the biology and systematics of the strains of *Sclerotium rolfsii*.]—*Rendic. R. Accad. Lincei*, xv, Ser. VI, 3, pp. 241–245, 1932.

In continuation of his earlier paper describing the two strains of *Sclerotium rolfsii* isolated in Italy from potato and aster [see preceding abstract] the author states that though Wolf's American strain is usually regarded as a typical strain of *S. rolfsii* it resembled in its mycelial characters more closely the strain isolated from asters in Italy. In the perfect stage (which developed shortly after the earlier paper had been sent to press) the hymenium of Wolf's strain was never a dense crust as in *Corticium rolfsii*, but loose and markedly aerial, more so, even, than the hymenium of the aster *Corticium* with which it agreed in the characters of the basidiospores. Between the last-named and Wolf's strain there was also a noticeable difference in the size, colour, and variability of the sclerotia. In the American strain they were usually small, frequently smaller than in the author's potato strain, but they tended to become aggregated and showed other characteristics in common with the aster organism. Further, from a discontinuous variation sector of the aster organism the author isolated a variant with a shorter aerial mycelium and more numerous, smaller, and more regular sclerotia than those of the parent strain. The author considers that there is evidently a close relationship between the aster *Corticium* and Wolf's strain, but his observations demonstrate the inexactitude of the views of those workers who base the taxonomy of *Sclerotium* species on the shape and size of the organs of conservation.

The study of these sclerotial fungi indicates that there are several distinct species confused under the common name *S. rolfsii*. Those that he examined fall into three distinct groups having as

type strains (1) the sclerotial stage of *C. rolfsii* (Sacc.) Curzi, (2) the sclerotial stage of *C. centrifugum* (= *S. centrifugum* n.comb.), and (3) *S.delphinii* Welch. Wolf's strain is placed in the second group. The salient characters of each group are given, and the strains falling into it listed.

GADD (C. H.). **Report of the Mycologist.**—*Tea Res. Inst. Ceylon Bull.* 8 (*Ann. Rept. for the year 1931*), pp. 16–19, 1932.

Experiments were conducted to test the efficacy of ferrous sulphate in the control of *Poria hypolateritia*, the causal organism of the most prevalent up-country root disease of tea in Ceylon [*R.A.M.*, x, p. 759]. The fungus was able to grow in Petri dishes on a medium containing amounts of the compound equivalent to 2½ tons per acre incorporated to a depth of 9 inches, so that control on these lines is hardly to be expected.

The 'bitten off' disease of tea seedlings appears to be usually associated with a neutral or alkaline condition of the soil [ibid., vii, p. 746], and is most frequently observed in nurseries on the sites of old coolie gardens. In one case tea showed 'bitten off' symptoms after planting out in a field in which the soil was decidedly alkaline.

Little progress has been made in determining the cause of the 'witches' broom' disease of tea [ibid., x, p. 760], which does not appear to be due to a parasite and is not so readily transmissible as a virus disease.

Several cases were investigated in which small areas of tea died suddenly, as though from a root disease. At first a few bushes wilt and die, followed later by as many as a hundred surrounding ones; after a few weeks the spread ceases and no further losses occur. Isolation trenches often failed to arrest the advance of the disease. No external fungus could be found on the roots, the cortex of which appears to be healthy except for long, narrow streaks and dark brown or chocolate-coloured circles with definite boundaries, sometimes penetrating the wood for a depth of 1 to 2 mm. No definitely parasitic organisms were detected in the root tissues, and the trouble is believed to be of physiological origin. Lightning was suspected to be the cause of this condition, and investigations in a few cases where the bushes were known to have been struck by lightning revealed symptoms similar to those described above, the bushes at the margin of the affected area being affected later than those near the centre.

Several cases of leaf disease of *Crotalaria* spp. due to *Parodiella grammodes* [ibid., x, p. 79] were reported during the year. Marked differences in the reaction of individual plants to the fungus were observed. Diseased plants should be eradicated and burnt.

THUNG (T. H.). **De huidige stand van het Phytophthora vraagstuk in de Vorstenlanden.** [The present status of the *Phytophthora* problem in the Vorstenland.]—*Proefstat. Vorstenlandsche Tabak, Meded.* 74, 50 pp., 21 figs., 1 diag., 1932. [English summary.]

In this full account of the present position of the practical knowledge of the 'lanas' disease of tobacco (*Phytophthora*

nicotianae) [*P. parasitica nicotianae*] in the Vorstenland district of Java [*R.A.M.*, xi, p. 334], it is stated that in consequence of the systematic disinfection of the 'dessa' manure by the application of carbon disulphide, or by stacking the fresh manure in heaps and leaving it to ferment [ibid., viii, p. 270], the main source of infection (contaminated manure from the native villages) is excluded and attacks are generally less serious. They do occur annually, however, on plantations in elevated situations with much water (irrigation or rain), infected silt being carried by the latter and distributed over the beds. The infection has been shown to come not only from water contaminated by the 'dessa' manure but also from that from the old tobacco fields and from the drainage water around the curing barns. The presence of the fungus is readily demonstrated by soaking leaves of susceptible tobacco in the water passed through the suspected material as well as by growing seedlings in it. The fungus grows readily on organic débris of all kinds and can multiply in the soil in the presence of any kind of plant remains if there is sufficient moisture. Soil disinfection experiments with lime and ammonium sulphate as recommended by Raciborski, formalin, sulphuric acid, and terbolan (1·5 per cent.) gave promising results.

Other methods of control should include the burning of diseased tobacco stalks; piling up the tobacco fruits and tops collected in the barns for compost; drying the stalks in the barns before distribution to the natives; and the disinfection of furnaces and barn floors.

THUNG (T. H.). **Smetstof en plantencel bij enkele virusziekten van de Tabaksplant.** [Infective principle and plant cell in some virus diseases of the Tobacco plant.]—*Handelingen 6de Nederl.-Ind. Natuurwetensch. Congr., 1931*, pp. 450–463, 1 pl., [? 1931. Received August, 1932.]

The author separated the infective agent of the white or whitish-yellow mosaic of tobacco from a plant which was also infected by the common mosaic as well as by ring spot. It is thought that the first-named, which occurs sporadically in Java, is probably the same as Johnson's and McKinney's yellow mosaic [*R.A.M.*, vi, p. 501; ix, p. 260; x, pp. 60, 410], and in accordance with the nomenclature of the former investigator it is termed 'virus VI', the common mosaic being 'virus I'. Both these were found to be readily transmissible by rubbing the leaves so as to break the hairs with a little of the sap of a diseased plant.

The first symptoms of white mosaic developed on tobacco plants five days after inoculation, the top leaves showing a light yellow coloration of the veins, while the inoculated leaf developed small yellow spots. White streaks also developed on the stem, especially the younger part. The youngest leaves became partially chlorotic, while the full-grown ones eventually developed yellow zig-zag lines along the veins. Microscopic examination showed that the cells underlying the white areas were devoid of chlorophyll, but this condition was purely temporary, the normal green coloration soon spreading over the affected parts. Topping the diseased plants resulted in complete recovery, except in the case of very

young individuals, the assimilatory functions of which were too much impaired by infection to be restored. When the top of a diseased plant is shaded and the older leaves are exposed to the light and allowed to continue assimilation, the new foliage assumes a different aspect from that of a normally growing infected top, being characterized by a uniformly green foundation with a few isolated yellow spots. The infective principle itself, however, undergoes no change, inoculations with sap from the diseased areas producing the typical symptoms.

The virus was found to be present in all the leaf tissues, even those fully matured at the time of inoculation, and shortly afterwards it was detected in every organ of the plant. It would appear that the virus must eventually be reproduced in every part of the living protoplasm and actually becomes incorporated with it. This theory is further supported by the fact that when the sap of the common and white mosaics is mixed in equal parts, the symptoms of both diseases develop independently in inoculated plants, and the infective principles of each are separately recoverable. In this case, apparently, only one of the viruses is reproduced, either because one reaches a particular group of cells before the other and multiplies to the exclusion of the latter, or on account of some agency in the cells which neutralizes the action of one virus and promotes that of the other. A certain antagonistic action must in any case be admitted to exist between a cell in which one of the two viruses is completely reproduced, and the second virus. This was demonstrated by inoculating a plant already suffering from white mosaic with the common type, the symptoms of which failed to develop. Inoculations with the sap of the twice infected plant produced only white mosaic in healthy individuals, showing that the virus of the common type was not even present in a latent condition. Similarly, plants affected by common mosaic fail to contract the white type on inoculation.

The infective principle of white mosaic is not transmissible by the seed to the progeny of a diseased plant, but it is probably present in the seed coat, since healthy plants infected with finely ground seed of plants with common or white mosaic contract the typical symptoms. Here also it would appear that only one virus is capable of reproduction, since plants inoculated with a mixture of diseased seed (common and white mosaic) showed exclusively the latter symptoms.

From the results of his researches the author inclines to the view that the tobacco mosaic virus is not a living autonomous organism, but rather, as held by Hunger (*Zeitschr. für Pflanzenkrankh.*, xv, [p. 257], 1905), a dead toxic substance constantly present in the cells but normally exerting no influence on the plant.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, 3, pp. 75–121, 1932.

Spain. On pp. 118–120 it is stated that from 21st November, 1931, consignments of mushroom [*Psalliota campestris*] spawn entering Spain must be accompanied by a duly authenticated certificate vouching for the facts that the manure used for the

cultures was sterilized (method to be stated), that the spawn is derived from pure cultures, and that the products are free from infectious diseases.

As from 24th April, 1932, all living plants and plant products imported into Spain must be accompanied by properly authenticated certificates guaranteeing the absence in the exporting territory in respect of imports of the specified host plants of the following diseases: *Guignardia bidwellii* on the vine, *Endothia parasitica* on chestnuts, *Diaporthe perniciosa* on fruit trees, *Synchytrium endobioticum* on potatoes and other Solanaceae, *Thielaviopsis* [*Ceratostomella*] *paradoxa* and *Fusarium* on bananas and pineapples, *Ascochyta chlorospora* on almonds with shells, *Graphium ulmi* on elm seedlings, cuttings, and branches, *Corticium salmonicolor* and *C. koleroga* on orange and other citrus fruits, *Bacillus amylovorus* on pears, apples, quinces, and other susceptible fruits, *Phyllosticta solitaria* on apples and other species of *Malus* [*Pyrus*], *Neofabraea malicorticis* on apples, pears, and quinces, and *Gymnosporangium juniperi-virginianae* on apples and *Juniperus virginiana*.

Ministère de l'Agriculture. Arrêté concernant le ' bunchy top ' du Bananier. [Ministry of Agriculture. Decree respecting ' bunchy top ' of the Banana.]—2 pp., 1932.

By a Decree of 18th June, 1932, the Egyptian Ministry of Agriculture declares the bunchy top of bananas to be a harmful disease within the meaning of Law No. 16 of 1916 concerning harmful diseases of fruit trees, and prohibits the transport, by rail, river, or air, except by special permit of the Ministry, of bananas and their foliage from the region lying between the Mediterranean Sea and the southern boundary of the Markaz du Guizeh to any other portion of Egyptian territory, all of which is declared to be infected. All the region south of the Markaz du Guizeh is declared to be in process of eradication of the disease, and all banana trees and their shoots found infected by bunchy top must be washed with paraffin, removed, and burnt.

United States Department of Agriculture. Plant quarantine and control administration. Modification of quarantine on account of the Citrus canker and other Citrus diseases.—1 p., 1932.

From 1st July, 1932, the seeds of citrus fruits will not be subject to the provisions of Quarantine No. 19 [*R.A.M.*, i, p. 367], since it has been ascertained that they may be freed from infection by *Bacterium* [*Pseudomonas*] *citri* by treatment with hydrogen peroxide. Such seeds, therefore, will automatically come under the provisions of Quarantine No. 37 (regulations 3 and 9) whereby the entry of citrus seeds free from pulp is permitted at specific ports, subject to disinfection under departmental supervision.

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MAGEE (C. J.) & MORGAN (W. L.). **Diseases and pests of glass-house Tomatoes.**—*Agric. Gaz. New South Wales*, xliii, 6, pp. 427–437, 7 figs., 1932.

This is a series of brief popular accounts of the more important parasitic diseases and pests that attack tomatoes under glass in New South Wales. The fungal and allied diseases dealt with include *Fusarium* wilt (*F. lycopersici*), *Verticillium albo-atrum* wilt, late blight (*Phytophthora infestans*), early blight (*Macrosporium* [*Alternaria*] *solani*), bronze or spotted wilt [*R.A.M.*, xi, p. 78], leaf spot (*Septoria lycopersici*), and mosaic. Recommendations for the control of these troubles are given in each case.

BÖNING (K.). **Die Bekämpfung der Brennfleckenkrankheit des Tabaks (Colletotrichum tabacum) durch Beizung des Samens und vorbeugende Behandlung der Pflanzen mit chemischen Mitteln.** [The control of Tobacco anthracnose (*Colletotrichum tabacum*) by seed disinfection and protective treatment of the plants with chemical substances.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, x, 3–4–5, pp. 89–106, 4 figs., 1932.

The seed is stated to be the primary source of infection of tobacco seedlings by the anthracnose or 'stem and rib scorch' disease due to a species of *Colletotrichum* in Bavaria [*R.A.M.*, ix, p. 746], although the incidence of primary infection in the seedlings is low (only 2 per cent. when unselected seed from diseased capsules and 1 per cent. when selected seed is sown). The spread of infection, notwithstanding this small proportion of diseased seedlings, is facilitated by dense sowing and generally proceeds with great rapidity. Experiments were therefore carried out in seed disinfection and spraying and dusting in the seed beds and in the field.

The results [which are tabulated and discussed] indicated that the seed may be largely freed from the adherent spores by appropriate treatment, though the internal mycelium may survive and cause a certain amount of infection in the subsequent stand. The best control in the seed-beds was given by 30 minutes' immersion in silver nitrate [cf. ibid., x, p. 134] or uspulun-universal, both at a strength of 0·25 per cent., which reduced the

incidence of anthracnose from 55 to 0 per cent. The seed stood immersion in uspulun-universal at strengths below 0·5 per cent. without injury, but at or above this strength injury to germination became apparent. Formalin caused no injury at 0·1 per cent. for 15 mins., but the control of the disease was somewhat less effective. When the seed was sprouted after treatment but before sowing, injury was caused at lower concentrations of the disinfectants [cf. ibid., v, p. 138].

Complete control by seed disinfection is probably not possible, as in some cases the mycelium appears to be within the tissues of the seed. Experiments in spraying the seed-beds were, therefore, undertaken and showed that Bordeaux mixture at 0·5 and 1 per cent. considerably reduced the amount of disease, dusting with cusisa [ibid., x, p. 706] and cupulvit [ibid., x, p. 582] also giving good results. Further experiments carried out on the crop after transplanting to the field confirmed the beneficial effects of spraying with 1 per cent. Bordeaux mixture or dusting with cusisa.

CALDWELL (J.). **Studies in the physiology of virus diseases in plants. III. Aucuba or yellow mosaic of Tomato in Nicotiana glutinosa and other hosts.**—*Ann. of Appl. Biol.*, xix, 2, pp. 144–152, 1 pl., 1932.

The experiments described in some detail in this paper showed that when tomato aucuba mosaic virus [*R.A.M.*, xi, p. 679] was rubbed on the leaves of *Nicotiana acuminata*, *N. glutinosa*, and *Datura stramonium*, necrotic spots developed on the treated leaves, but no systemic infection of the plants as in *N. tabacum* [ibid., xi, p. 333] resulted. The spots were about 5 mm. in diameter, roughly circular, and increased only slightly for a few days. No intracellular inclusions were found in the cells of the inoculated leaves. It was shown that in *N. glutinosa* the virus is unable to move across the lamina of the leaves or to enter unbroken cells, the latter fact having been demonstrated by experiments in which the intercellular spaces of the leaves were injected with virus juice without exhibiting any symptom of infection. This was further confirmed by the fact that it was found possible to grow tomato seedlings on cotton wool soaked in virus juice, the resulting plants growing fairly rapidly and remaining free from infection. The work amply supported Holmes's suggestion of using *N. glutinosa* as a ready means of demonstrating the presence of the virus agent in a juice [ibid., viii, p. 532].

Experiments with tomato and *D. stramonium* grafts in various combinations indicated that the aucuba mosaic virus travels through the *D. stramonium* tissues without causing any mosaic symptoms on this host, but that after this passage it can infect the tomato whether the latter is scion or stock.

KRAYBILL (H. R.), BREWER (P. H.), SAMSON (R. W.), & GARDNER (M. W.). **A noninfectious leaf-deforming principle from mosaic Tomato plants.**—*Phytopath.*, xxii, 7, pp. 629–636, 2 figs., 1932.

Filiform leaf deformities ('fern-leaf') closely resembling certain

mosaic symptoms were produced on the new growth of tomato seedlings by massive inoculation with filtrates obtained from mosaic plants and rendered non-infectious by heating to 126° C. for $2\frac{1}{2}$ hours [*R.A.M.*, ix, p. 417; x, p. 346]. In no case was an active filtrate obtained from healthy tomato plants. The leaf deformities were also readily induced by means of filtrates from infected plants stored *in vitro* for from three to ten months, while in one case the fermented juice stored for four years caused fern-leaf in 12 out of 20 inoculated plants.

When plants showing marked leaf deformities from inoculation with the leaf-deforming principle were crushed and used as inoculum for healthy plants, no deformities were produced in the latter. The leaf-deforming principle, therefore, is evidently not transmissible from plant to plant like a virus, nor does it increase in the plant in the absence of mosaic virus. Further evidence that the leaf-deforming principle and the mosaic virus are not identical was afforded by the fact that the inoculation of tomato plants with the former combined with the 'healthy potato' virus did not produce streak, which would have developed in the presence of the tomato mosaic virus [cf. ibid., x, p. 537; xi, pp. 271, 679]. Similarly, inoculation with the juice of plants showing only the leaf deformities and with the potato virus failed to produce streak. In general, the most active filtrates were prepared by permitting the juice from mosaic plants to autolyse or ferment, suggesting that the leaf-deforming principle may be formed through decomposition of the plant juice constituents, though apparently it is a product of diseased tissues only. It is considered to be non-living and not of the nature of a virus.

GRAVATT (G. F.) & CLAPPER (R. B.). **Verticillium wilt of Maple, Ailanthus, and Elm.**—*Plant Disease Reporter*, xvi, 9, pp. 96–98, 1932. [Mimeographed.]

In Virginia, Washington, D.C., Rhode Island, and New Jersey, Norway and sugar maples [*Acer platanoides* and *A. saccharum*] have recently been found suffering severely from the wilt due to *Verticillium* [*albo-atrum*: *R.A.M.*, xi, p. 213], characterized by typical green or dark streaks in the white sapwood. In the spring of 1932 the same disease was observed on an *Ailanthus* [*glandulosa*] tree in the vicinity of the infected maples, while a report from New York City states that the fungus is spreading on *Ailanthus* attacked last autumn [ibid., xi, p. 550]. This host was also found infected at Philadelphia in 1931. In Ohio the wilt appears to be declining in prevalence on elms.

FISCHER (R.). **Das Ulmensterben.** [The die-back of Elms.]—*Die Natur*, Vienna, *1931*, p. 61, 2 figs., 1931. [Abs. in *Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xlii, 7–8, p. 397, 1932.]

Since the first authentic record of elm die-back [*Ceratostomella ulmi*] in Austria in 1926 [*R.A.M.*, vii, p. 684; xi, p. 409], numerous fine trees in the avenues of Vienna have succumbed to the disease, which in some cases has assumed an acute, in contrast to the usual chronic form.

ZAPROMETOFF (N. G.). Бактериоз и карликовость—новые болезни Шелковицы в Средней Азии. [Bacteriosis and dwarfiness—new diseases of the Mulberry in Central Asia.]—*Шелководство* [*Sericulture*], Moscow, *1932*, 5, pp. 36–38, 1932.

The author states that young mulberry [*Morus* spp.] trees grown from cuttings imported from Japan and planted in 1930 in an experimental nursery near Tashkent were found in 1931 to be infected with *Bacterium mori* [*R.A.M.*, x, p. 347], of which he considers *Bact. cubonianum* to be a synonym [cf. ibid., viii, p. 142]. While the disease has, so far, done little damage to the trees, the fact that it is apparently a new introduction and that it was also observed on trees of a local species growing close to the infected Japanese plants and on which the organism had not been seen hitherto, calls for serious attention, owing to its unknown potentialities in a new area of dispersion. Some recommendations for its control are given.

The Japanese cuttings also showed incipient symptoms of a disease, termed dwarf disease, which is stated to be economically important and very widespread in Japan [ibid., iv, p. 364], where it is considered to be a functional trouble, although its true nature has not yet been definitely established. In its initial stage the disease is characterized by a slight wrinkling of the leaf blades, whose surface becomes granular and firmer to the touch than normal, but without any colour change. In the second stage the leaves become smaller and more deeply indented, acquire a hard texture and assume a yellowish-green tinge. They develop on considerably shortened internodes, and the new shoots are weak and slender. In the third and final stage, the symptoms are enhanced and the trees assume a witches' broom-like aspect. The root system of the affected trees also develops less vigorously than normal.

OGILVIE (L.). **Notes on the rusts of basket Willows and their control.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1931*, pp. 133–138, 1 pl., [1932].

Salix triandra and *S. viminalis* grown commercially for basket-making in Somerset are each attacked by a rust. On the former host, on which all stages of *Melampsora amygdalinae* [*R.A.M.*, x, p. 584] are found, the most important stage in the life-history of the fungus, from the growers' point of view, is the infection of the green stem. This first takes place early in July, usually near an infected leaf stalk. These infections are not extensive but as the stem enlarges and hardens, elongated, depressed cankers form, which, like the uredo pustules on the leaves, produce orange uredospores throughout the summer. The uredo stem cankers remain dormant during the winter, producing a fresh crop of uredospores in early spring. On rods in pits uredospores may appear in March. Initiation of the yearly cycle may be brought about by sporidia shot off from the old leaves on the ground giving rise to aecidia, the aecidiospores from which again give rise to uredo pustules, or by uredospores liberated from overwintered cankers on old rods.

The teleutospores of the rust fungus, *M. larici-epitea*, which

occurs on *S. viminalis*, germinate in early spring, giving rise to sporidia which were found experimentally to infect the leaves of larch (*Larix europaea*). About a fortnight after infection, minute, pale orange aecidial pustules are produced on the larch leaves; apparently they are formed out of doors in May and June. The resulting aecidiospores in turn infect young leaves of *S. viminalis*, on which uredo- and teleutospores are produced. The rust does not form cankers on the stems, and the only method of overwintering appears to be by means of teleutospores on dead leaves. This rust is not of great economic importance.

LEVEN (G.). **A die-back disease on Pines (Brunchorstia destruens Erikss.).**—*Quart. Journ. of Forestry*, xxvi, 3, pp. 225–231, 3 pl., 1932.

After listing the different species and varieties of *Pinus* upon which *Brunchorstia destruens* [*R.A.M.*, xi, p. 136] has been reported in different parts of the world, the author, writing from a practical point of view, states that the disease is certainly on the increase and already of more than academic interest; he has observed it in many parts of Scotland as well as in Lincolnshire. A visit to Denmark in 1932 showed that it was extremely widespread there [ibid., viii, p. 686], French mountain pine (*P. montana* var. *gallica*) in Western Jutland being badly attacked on heath areas. In the last ten or twelve years the disease has been observed in Britain on Austrian (*P. laricio* var. *austriaca*), Corsican (*P. laricio*), and mountain pines (*P. montana* var. *uncinata*) [ibid., vi, p. 196], while the appearance of certain Scotch pines (*P. sylvestris*) has long been disquieting [cf. ibid., ix, pp. 215, 569]. *P. montana* var. *uncinata* has probably been the most susceptible tree in Britain, the Austrian pine has been only a little less so, while the Corsican pine withstood the disease better than either. From personal observation the author has gained the impression that the organism is parasitic on *P. sylvestris*, but very weakly so where the host is growing under normal conditions.

SZILVINYI (A.). **Trichoderma nunbergii n. sp.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxvi, 5–7, pp. 135–139, 2 figs., 1932.

A species of *Trichoderma*, differing in its morphological and physiological characters [which are described] from any hitherto reported, was isolated from the feeding galleries of *Pictyogenes curvidens* in the conifer forests of the mountains of Silesia. The viscosity of the conidia facilitates their adhesion to the beetles which disseminate them in the galleries, but no symbiotic relation between fungus and insects could be demonstrated.

FINDLAY (W. P. K.). **Laboratory methods for testing wood preservatives.**—*Ann. of Appl. Biol.*, xix, 2, pp. 271–280, 1 graph, 1932.

The author briefly reviews and discusses the various methods used in Europe and America for the testing in the laboratory of wood preservatives, and points out their respective advantages and defects. In outlining the desiderata which are to be borne in mind in these trials, he states that the experiments should be carried out with pure cultures of the timber-rotting organisms, each preservative

being tested against a number of species of the latter. The culture medium should be the material which it is desired to protect against fungal attack; this material should be as nearly as possible in its normal physical condition, and the conditions for the growth of the organisms tested must be optimum.

SCHMITZ (H.) & BUCKMAN (S.). **Toxic action of coal-tar creosote with special reference to the existence of a barren nontoxic oil.**—*Indus. & Engin. Chem.*, xxiv, 7, pp. 772–777, 1 fig., 4 graphs, 1932.

Malt agar cultures of *Fomes annosus* and *Trametes serialis* were exposed to the action of eleven components of a coal-tar creosote sample separated by distillation [cf. *R.A.M.*, viii, p. 621; ix, p. 619; x, p. 217].

The original preparation was moderately toxic, killing *F. annosus* at a strength of 0·9 to 1 and *T. serialis* at 1 to 2 per cent., while the growth of both fungi was inhibited for two weeks at 0·1 to 0·2 per cent. The fraction of the coal-tar creosote distilling below 285° C. was much more toxic than the original, destroying *F. annosus* at 0·04 to 0·06 and *T. serialis* at 0·06 to 0·08 per cent. The fraction distilling between 285° and 350° showed a considerable drop in toxicity, concentrations of over 20 per cent. being necessary to destroy either fungus. The residue distilling above 350° failed to inhibit completely the growth of the test organisms even at concentrations above 20 per cent., but it exerted a marked retarding action on their development even at 1 per cent. A crystalline material formed on cooling the fraction distilling below 285° proved remarkably toxic, killing both fungi at 0·02 to 0·04 per cent.; this substance appears to be a form of naphthalene containing impurities to which its toxicity may probably be attributed. *F. annosus* was also destroyed by 0·02 to 0·04 per cent. solution of the fraction distilling below 285°, subjected to ten alternate washes with acid and alkali, redistilling, treatment with methanol solution of mercuric chloride, treatment with metallic sodium, redistilling, and washing with water, and *T. serialis* at 0·01 to 0·02 per cent. A bright yellow precipitate which formed on cooling the 285° to 350° fraction proved moderately toxic, a 5 per cent. concentration inhibiting the growth rate of *F. annosus* by about 72 per cent. and that of *T. serialis* by 68 per cent. When the 285° to 350° fraction was subjected to the various treatments described above for the fraction below 285°, it yielded a substance resembling Bateman's 'barren oil' [cf. ibid., iii, p. 617; v, p. 398], which at a strength of 1 per cent. inhibited the growth of *F. annosus* by 95·6 per cent. and at 20 per cent. by 96·5 per cent., the corresponding figures for *T. serialis* being 93·5 and 98 per cent.

The results of these experiments are discussed in the light of some of the recent researches on wood preservation and allied subjects.

OGILVIE (L.) & MULLIGAN (B. A.). **Progress report on vegetable diseases. III.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1931*, pp. 119–132, 2 pl., [1932].

Surveys made in the Evesham area in 1931 emphasized the

serious and widespread nature of halo blight (*Bacterium medicaginis* var. *phaseolicola*) of dwarf beans (*Phaseolus vulgaris*) recently recorded for the first time in England [*R.A.M.*, x, p. 434; xi, p. 143]. Canadian Wonder, Early Prolific, and Masterpiece were highly susceptible. Evidence was obtained that ground which has borne diseased plants does not necessarily bear infected beans in the following season, most field infections arising from infected seed. The chief hope of control [cf. ibid., x, p. 423] appears to be in the use of resistant varieties. In field trials the following showed resistance: Black Wonder (partially), Ne Plus Ultra (partially), Incomparable, Magpie, and Superlative.

In further varietal tests of the resistance of dwarf bean varieties to dry root rot (*Fusarium martii* var. *phaseoli*) [ibid., xi, p. 143], Early Saxony and Early Pacific were susceptible, but Sharpe's Goliath and Magnum Bonum were resistant, probably owing to their thick stems and extensive roots. Flageolet St. Andrew and Incomparable also gave fair results.

Leeks were affected, sometimes rather seriously, by a *Botrytis* which produced grey, elongated, depressed spots later enlarging into well-defined grey or whitish areas with water soaked edges, near the tip or base of the leaves. Mouse-coloured conidiophores and conidia were present on both surfaces.

Spring onions were attacked by a small-sclerotial, highly pathogenic *Botrytis* which produced small, circular or elliptical, white spots often surrounded by a water soaked margin; the area surrounding the spots sometimes dried out, turning yellowish-green or grey, so that the tips of the leaves died.

Ascochyta pisi and *Mycosphaerella pinodes* [ibid., vii, p. 611; x, p. 408] were prevalent on peas in the vicinity of Bristol, the former causing a severe spotting of the pods and the latter, in addition, a severe foot rot.

About 1 per cent. of peas grown from commercial samples at Long Ashton were affected by a mosaic, the leaves and stipules being strikingly mottled with pale green or yellowish-green depressed or raised, usually interveinal areas. The pods were distorted and showed irregular, linear, depressed, dark green areas. The stems were also mottled. Preliminary experiments indicated that the disease is transmissible by rubbing.

HENDRICK (J.). **The prevention of finger-and-toe in Turnips. Liming and a disease-resistant variety.**—*Trans. Highland & Agric. Soc. of Scotland*, Ser. 5, xliv, pp. 52–63, 1932.

The results [which are fully discussed and tabulated] of five years' experiments at Craibstone, Aberdeen, indicate that the yellow Bruce turnip variety is able to withstand infection by finger-and-toe [*Plasmodiophora brassicae*] even on land saturated with the fungus on which reputedly resistant varieties, such as Victor Achilles, are practically wiped out [*R.A.M.*, x, p. 637]. It yielded almost a full crop on plots that have borne turnips every season for the last 15 years, and on the unlimed parts of which all other turnip and swede varieties tested of recent years have been virtually destroyed by the disease.

STILBACH (K.). **Beobachtungen an Erbsenrost.** [Observations on Pea rust.]—*Deutsche Landw. Presse*, lix, 24, p. 302, 1932.

Considerable damage is stated to be caused in Germany by pea rust (*Uromyces pisi*), the aecidial stage of which is formed on *Euphorbia* spp., especially *E. cyparissias* [*R.A.M.*, vii, p. 540; ix, p. 602]. In greenhouse and field experiments in 1929 and 1930, pieces of the latter plant, heavily infected by the rust, were enclosed in paper bags and tied over the pea shoots for 14 days. At the end of this period the first uredo pustules were observed, and a rapid spread followed, neighbouring plants becoming infected.

A large number of garden and field pea varieties tested in 1930 all proved susceptible to rust, as did also a series of species of *Lathyrus* with the exception of *L. sativus*, which remained completely immune. On some species of *Lathyrus* teleutospores were produced directly following the infection.

GROOSHEVOY (S. E.). **Root rot disease of the seedlings of Sugar Beet.**—*Proc. Exper. Select. Stat. Mironovka*, Kieff, pp. 1–49, 1931. [Russian, with English summary. Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, *1932*, 1–2, p. 13, 1932.]

Sugar beet seedlings are stated to be most severely damaged by *Phoma betae* [in the Ukraine] at a temperature of 19° C. [*R.A.M.*, x, p. 425]. When attacked before the formation of the third leaf pair the plants may sustain a loss of 50 per cent. or more by weight. Root rot is most injurious to seedlings from seed-clusters harvested before maturity or to poorly developed ones; the incidence of infection is reduced by the application of stable manure to the seed-bearing crop. The disease is most prevalent where crop rotation is neglected; the best forerunners for beets are stated to be peas. The heaviest damage recently occurred in very alkaline and neutral clay soils, whereas the epidemic of 1926 took place under acid soil conditions.

DRAKE (C. J.), TATE (H. D.), & HARRIS (H. M.). **Preliminary experiments with aphids as vectors of yellow dwarf.**—*Iowa State Coll. Journ. of Sci.*, vi, 3, pp. 347–354, 1 pl., 2 figs., 2 graphs., 1932.

This is the full account of the work described in a preliminary paper which has already been noticed [*R.A.M.*, xi, p. 556]. Of the additional information given it may be mentioned that under certain conditions the symptoms of yellow dwarf of onions may be completely masked until the onions have undergone a rest period and then been regrown. Both young and old masked plants were proved capable of infecting aphids which subsequently convey the disease to healthy onions. The aphids are not able to breed or to live for more than three to six days on the onion alone which is only a transient host, serving to help sustain the wandering lice during migration. A single aphid was proved to be capable of inoculating a plant, but the percentage of transmission under such conditions was much less than when a higher number was used. Aphids caged for 30 minutes on diseased plants and then transferred individually to healthy ones for a like period successfully

inoculated them, thus demonstrating how migratory lice may inoculate plants by single feedings. On the third or fourth day after inoculation the onion becomes a source of infection for aphids and remains so, but the aphids soon lose the virus unless constantly reinfected from diseased plants. The degree of injury depends upon the stage when the plant is inoculated, but sets infected soon after the new foliage appears frequently fail to make any appreciable growth.

STEVENS (N. E.). **United States of America: an unusual outbreak of Celery early-blight.**—*Internat. Bull. of Plant Protect.*, vi, 6, pp. 94–95, 1932.

Early blight of celery (*Cercospora apii*) is reported by P. L. Wellman to have been so destructive in Florida during the winter season of 1931–2 that the usual control measures were ineffectual [*R.A.M.*, x, p. 220]. The virulence of the fungus is believed to have been correlated with the unusually high temperatures and relative humidity prevailing during this period. The weather conditions recognized by growers as favouring early blight are rainless spells accompanied by light easterly winds, warm, bright days, and nights sufficiently cool to produce a heavy dew. In many cases the crop was ploughed up as worthless for harvesting, while even the marketable plants were of inferior quality owing to the damaged leaves and petioles, the condition of which was aggravated by the attacks of saprophytes, such as *Alternaria* and *Botrytis*.

PASCALET (M.). **La mosaïque ou lèpre du Manioc.** [Mosaic or leprosy of Cassava.]—*Agron. Colon.*, xxi, 172, pp. 117–131, 4 pl., 10 figs., 1932.

In the Javanese form of cassava mosaic [*R.A.M.*, xi, pp. 152, 621] the young plants show a perfectly characteristic regression in the tissues of the leaf, which may progress so far as to lead to partial or complete abortion of the organ (as in human leprosy) but there is little alteration in the normal green colour. In the African form chlorosis is a more marked symptom but is unlike that of the more usual mosaic diseases in that the discoloured areas are intensely bleached and are sharply bounded by the veins. Infected cuttings or seed may produce plants that appear to be almost normal until after the development of the eighth or tenth leaf when regressive changes appear; with intensive manuring these plants tend to resume a normal appearance. In more serious attacks the regression produces a shortening of the internodes and obvious dwarfing, the terminal shoot showing a rosette type of development.

The internal modifications are at first histological and subsequently cytological. In those parts which are merely discoloured the palisade tissue is reduced and the cells composing it are much shortened. When there is also hyperplasia the reduction of the palisade parenchyma is accompanied by an increase of the mesophyll, in which the fibro-vascular bundles are disarranged, the reduced area of the leaf surface being unaccompanied by any equivalent reduction in the vascular system; in the regressed

leaves the small bundles are separated from each other only by a few mesophyll cells. This causes an extreme abnormality in the structure of the blade, which is thickened by this accumulation of vascular elements under a reduced surface area.

The modifications which take place in the cellular contents are as follows. The areas which are turning white contain fewer but much larger plastids than the normal tissues, and these plastids contain smaller starch grains and more diffuse contents than the normal. The chlorosis results first from a loss of pigment, then a reduction in the number of plastids, finally there is an undue preponderance of normally uncoloured tissues such as the fibrovascular elements.

Cassava mosaic, first reported by Dammer from east Africa in 1895, is present in an intense form in the central region of the French Congo and in Gabun. It is probably endemic in Dahomey, the Ivory Coast, and Togo. It has been reported from Sierra Leone [ibid., vii, p. 304], occurs, probably sporadically, in the Belgian Congo [ibid., x, p. 166], is present over the whole area of cassava cultivation in the Cameroons [ibid., ix, p. 11; x, p. 639], in an endemic form in the south and south-east of this region, epidemically about Yaounde, and sporadically further north. Gabun suffers worst; in the north of this locality the crop was most seriously reduced in 1920–1921. At this date the disease apparently spread towards the Cameroons and into the French Congo. In one locality where cuttings of resistant American varieties have been introduced the disease has diminished, the prophylactic methods recommended by the local French agricultural station also having had a marked effect, especially in eliminating types of cassava weakened through inherited mosaic.

The author definitely inclines to the view that insect vectors play the chief role in transmitting the disease. The disease was experimentally transmitted by grafting but not by juice inoculations. It was ascertained that it may be present in a latent form, as plants apparently healthy may give diseased progeny. Soil which has borne a diseased crop remains contagious to healthy plants for at least two years.

The only practicable method of control consists in the careful selection of resistant varieties, attention also being paid to sources of contagion.

A bibliography of 14 titles is appended.

DADE (H. A.). **Cassava mosaic.**—*Gold Coast Dept. of Agric. Year-Book 1930 (Bull. 23)*, pp. 245–247, 1931.

Farmers in the Gold Coast state that mosaic of cassava (*Manihot apii*) [see preceding abstract] was first seen locally in a mild form in 1926 at Aburi. Until 1929 occasional searches for the disease in various parts of the country met with no result, but in that year and the next it began to appear quite commonly in some districts, and in a form sufficiently severe to be of marked economic importance. In a short time the disease will have spread throughout the Gold Coast, where, cassava being one of the staple native food crops, the outlook is serious. Experiment showed that two varieties, Calabar II and Bankye sareso, are resistant. Both are

less suitable than the more commonly cultivated and susceptible varieties, but provide material from which by selection and crossing, an immune and hardy short-period form (i.e., one with tubers which become ready for lifting after about thirteen months) with good food qualities may be derived.

WRIGHT (J.). **Root rot of Coco-yams.**—*Gold Coast Dept. of Agric. Year-Book 1930* (*Bull.* 23), pp. 184–197, 3 pl., 1931.

Root rot of coco-yams [*Xanthosoma sagittifolium* and *Colocasia antiquorum*] is now a very serious disease in the Gold Coast, where it was first reported in 1925. The disease may appear any time after planting, and may destroy the shoots from the sprouting seed pieces before they appear above ground, or cause them to remain extremely stunted, with abnormally small leaves, in which case they may die off after becoming well established. The visible symptoms in grown plants are flaccidity and yellowing of the leaves, which develop chlorotic patches and are often attacked by *Cladosporium colocasiae, Phyllosticta colocasiae,* and insects, the whole plant eventually wilting. The roots of the diseased plants show blackening, necrosis, and wet rot, which usually starts from the tips but may begin from lesions anywhere along their length. Roots so affected rapidly become completely discoloured and die and the decay reaches the corms, rotted hollows forming where the roots arise and leading to complete putrefaction. The decaying corms are usually coated with the mycelium of *Sclerotium rolfsii*.

Isolations from discoloured but turgid tissues yielded species of *Fusarium*, a *Rhizoctonia*, species of *Actinomyces*, yeasts, and bacteria. None of these organisms was invariably present, but a Phycomycete, presumed, from the general similarity of the disease to that found on the same host elsewhere, to be *Pythium aphanidermatum,* was present in the diseased tissues in most cases examined, though attempts to isolate it failed.

Artificial infection experiments indicated that the condition of the soil is the determining factor in conducing to the disease. Infection is not carried by the seed. It is presumed that the disease is caused by *P. aphanidermatum*, and occurs only when the plants are subjected to some physiological disturbance.

Moisture and soil reaction did not affect the incidence of infection. It is thought probable that potash deficiency is a primary factor. The local farmers maintain that the condition does not occur on virgin soil. Coco-yams may grow normally for two or three years on a farm cleared from secondary bush, after which it becomes impossible to cultivate them. It was observed that coco-yams grown in soil from which the secondary bush has been burned off and to which potash has thus been supplied develop much better than those in areas where only clearing has been effected. The former soil was found to have a potash content (expressed as percentage of fine earth) of 0·09 at four inches and 0·08 at one foot, whereas the latter had only 0·03 per cent. In the course of one field drainage experiment in infected soil only three plants grew to a reasonable size; they were on the edge of a plot near which a large heap of bush cuttings had been fired when the plants were

about two months old, and though attacked early had made a good partial recovery. Part of the same experimental area had previously grown cassava and the disease was much more severe in the early stages on this part than elsewhere. It is presumed that the cassava had removed large quantities of available potash from the soil.

All varieties of coco-yams tested were susceptible. [Elsewhere in the Year Book it is stated that the varieties grown include four of *X. sagittifolium* and one of *C. antiquorum.*] Control by rotation, applications of wood ash, and improved general sanitation is suggested, and there is a bibliography of 20 titles.

LAMBERT (E. B.). **'Bruise spot' disease of cultivated Mushrooms widespread in 1931–1932.**—*Plant Disease Reporter*, xvi, 3, p. 25, 1932. [Mimeographed.]

Severe damage from a hitherto undescribed disease of edible mushrooms to which the name 'bruise spot' is applied, was reported from New York, Pennsylvania, Ohio, and Illinois during the winter of 1931–2. The spots are bluish-grey on the surface, dry, and usually sunk in the tissues of the cap, arresting the growth of the latter. They are quite distinct from the superficial slimy, dark brown blemishes due to *Bacterium* [*Pseudomonas*] *tolaasii* [*R.A.M.*, xi, p. 493]. A *Verticillium* has constantly been found associated with these spots and produces the typical symptoms on inoculation into healthy caps. It is probably related to *Mycogone perniciosa,* but fails to form the chlamydospores characteristic of this genus on potato dextrose agar or mushroom tissue.

RAVAZ (L.). **Chronique. Toujours le mildiou.** [Current events. Mildew still.]—*Prog. Agric. et Vitic.*, xcvii, 26, pp. 617–620, 1932.

In this note on the seasonal development of vine mildew [*Plasmopara viticola*] in the region of Montpellier in 1932, it is stated that heavy rains on the 2nd and 5th of June caused very severe outbreaks of the disease on the 13th and 14th of the same month; a light rain on the 13th led the local meteorological station to forecast a further outbreak for the 20th June, and this materialized on the day predicted, in a very severe form. Even wild American vine species (e.g., *Vitis lincecumii*), which are usually resistant, were infected, but on them the fairly numerous mildew patches on the leaves did not spread beyond 1 cm. in diameter and the leaves were not killed.

SARTORIUS (O.). **Peronospora-Bekämpfung mit Staubmitteln in der Rebschule.** [*Peronospora* control with dusts in the Vine nursery.]—*Der Deutsche Weinbau, 1931*, p. 147, 1931. [Abs. in *Zeitschr. für Pflanzenkrankh. und Pflanzenschutz,* xlii, 7–8, p. 396, 1932.]

Grafts of Portuguese vines on 3309 in a German nursery dusted eleven times with cusisa [*R.A.M.*, x, p. 706] were more heavily infected by *Peronospora* [*Plasmopara viticola*] than those given eight applications of 1 per cent. Bordeaux mixture. The former,

however, suffered less retardation of growth than the latter and presented a strikingly green and healthy appearance in October.

Ravaz (L.). **Chronique. Les bouillies à la chaux. Les brûlures.** [Current events. Lime-containing sprays. Scorching.]—*Prog. Agric. et Vitic.*, xcvii, 24, pp. 569–573, 1 fig., 1932.

The author states that the degree of acidity or alkalinity of Bordeaux mixtures as used in vineyards is easier to regulate when the copper sulphate solution is poured into the lime solution than *vice versa*, the latter method leading to the formation in the precipitate of voluminous vesicles consisting of a lime nucleus surrounded by a wall of a cupric salt, thus preventing a proportion of the lime, hard to determine, from exerting its neutralizing effect on the copper sulphate. The former method, which is in common use in Germany and Switzerland, should be followed also in France, more particularly for the early sprayings, when the vine foliage is still tender and very susceptible to scorching. Field observations indicate that glabrous vine leaves are much more liable to scorching from sprays than the hairy or downy ones.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1931.** [Review of phytopathological records observed in 1931.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 1, pp. 1–64, 4 figs., 1932.

This report, which is on similar lines to those of previous years [cf. *R.A.M.*, x, p. 774], contains among numerous others the following items of phytopathological interest.

A wilt of undetermined origin was reported from various parts of Italy as affecting young vines grafted on American stocks. The roots were normal but growth gradually ceased in the previous year's branches, with the result that either the shoots failed to develop or the new branches dried up during the summer. This necrosis progressed from the top downwards, the aerial parts withering completely in two years; finally, the roots and underground part of the trunk were attacked by *Dematophora* [*Rosellinia*] *necatrix* and other soil fungi and the stems by various weak parasites. Apparently, the American stocks had become subjected to some special physiological conditions after grafting, and this had reduced the functional capacity of the graft, with the result that it became highly susceptible to attack by wood-inhabiting fungi.

Bananas from Italian Somaliland showed *Stachylidium theobromae* present saprophytically on wilted organs [ibid., x, p. 806], black tip of the leaves and axis of the inflorescences (*Helminthosporium torulosum*) [ibid., xi, p. 464], and black pit of the fruits usually attributed to the last-named fungus but associated with which Curzi found *Gloeosporium musarum*, *S. theobromae*, and various species of *Fusarium*. A rot of banana shoots in the same region was attributed to a *Pythium* or a *Phytophthora*.

Apple trees growing near Bologna developed a collar rot, the mycelium of a *Phytophthora* being present in the necrosed tissues. A bacteriosis of the branches of apple trees from the same vicinity was also reported as resembling fireblight (*Bacillus amylovorus*); the organism is being identified.

Pseudomonas [*Bacterium*] *juglandis* [ibid., xi, p. 338] was present in young walnut branches in a young plantation near Rome at an altitude of 400 m.

Bitter orange seedlings (*Citrus vulgaris*) [*C. aurantium* var. *bigaradia*] from Eritrea were attacked by *Rhizoctonia* [*Corticium*] *solani*, the disease destroying about one-tenth of the plants.

As Dutch elm disease (*Graphium ulmi*) has already become prevalent over a large part of Italy [see below, p. 810] preparations are being made to grow *Ulmus pumila*, while numerous varieties received from Holland (including *U. davidiana*, *U. karagatch*, *U. elliptica*, *U. pumila*, *U. pumila* var. *pinnato ramosa*, *U. turkestanica*, *U. japonica*, *U. parvifolia*, and *U. wilsoniana*) [ibid., xi, p. 484] have been grafted on to *U. campestris* for inoculation tests.

Spinach in the vicinity of Trieste was attacked by a disease closely resembling the American curly top [ibid., viii, p. 83]; the plants were rachitic and the leaves under-developed, the blades being crinkled, irregular in shape, and asymmetrical, and the mesophyll fleshy and containing much water.

Seedlings of an oriental variety of tobacco received from Lecce were found to be affected with a bacteriosis identified as due to *Bacterium pseudozoogloeae* [ibid., x, p. 62]. The disease is stated to develop in April, causing the formation of rusty spots on the small leaves of the seedlings, which rapidly dry up and die.

A *Phytophthora* determined as *P. terrestris* [*P. parasitica*] caused a foot rot of *Lupinus luteus* in Capua.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1931.** [Report on the activities of the Phytopathological Service in the year 1931.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 66, 135 pp., 5 pl., 1 diag., 1932.

This report, prepared on the usual lines [*R.A.M.*, xi, p. 95], contains much valuable information, of which the following items may be mentioned. *Septoria nodorum* caused considerable damage to wheat [ibid., vii, p. 425] especially on sandy and marshy soils where the so-called 'reclamation disease' is prevalent [ibid., x, p. 487]. Oats were attacked by *Dilophospora graminis* [*D. alopecuri*: ibid., ix, p. 623], not hitherto recorded on this host, and also by *Ophiobolus graminis*. Good control of barley stripe [*Helminthosporium gramineum*] was given by immersion in germisan (100 gm. in 3 l. water per 65 kg. seed-grain) or U. 520 (25, 50, or 100 gm.), was well as by dusting with ceresan (3 gm. per kg.).

Late blight of potatoes (*Phytophthora infestans*) occurred in an extremely severe form at an exceptionally early date (27th May) on the Eersteling [Duke of York] variety in the north of the country [cf. ibid., xi, p. 123]. Experiments were undertaken to determine the efficacy of various compounds in destroying the foliage in order to prevent infection of the tubers, and it was found that 5 per cent. copper sulphate plus 1 per cent. sodex or agricultural salt answered the purpose very satisfactorily. Tubers of the Bevelander variety from Andel showed the typical symptoms of net necrosis as described from the United States [ibid., x, p. 746]. The progeny

of Eigenheimer potato tubers lifted on 5th July showed 6·2 per cent. mosaic, compared with 32·2 per cent. from those lifted on 22nd September [cf. ibid., viii, p. 457].

The yellowing disease of beets was again widespread [ibid., xi, p. 96] and its cause remains obscure.

Plum trees were killed by *Diaporthe perniciosa* [ibid., vi, p. 463]. Two kinds of pycnidia developed on fragments of diseased bark, the majority being of the *Phomopsis* type while a few belonged to *Cytospora* [ibid., ix, p. 547].

Tomato plants in the Naaldwijk district were extensively damaged by *Colletotrichum tabificum* [*C. atramentarium*: ibid., x, p. 413], while a bacterium believed to be *Aplanobacter michiganense* was also isolated from the same host. At Enkhuizen tomato plants developed a pale, later brown to bronze, and ultimately black spotting and shrivelling of the foliage. The condition, which was infectious and transmissible by grafting to healthy plants, was attributed by Prof. Quanjer to a hitherto undescribed virus. Good control of tomato leaf mould (*Cladosporium fulvum*) was given by spraying with 1 per cent. solbar, followed either by elosal neu [ibid., vi, p. 670] or by dusting with cupulvit [see above, p. 754].

Black salsify (*Scorzonera*) [*hispanica*] was infected by *Sclerotinia* (? *libertiana*) [*S.* ? *sclerotiorum*] which seriously impaired seed production [ibid., x, p. 328], and the same fungus caused a rotting of endives at the stem base. *C.* (?) *macrocarpum* was responsible for a spotting of spinach leaves not previously recorded in Holland.

William Copeland tulip bulbs were found to be infected by *Sclerotium delphinii* [ibid., x, p. 693], while *S. gladioli* was observed on freesia and crocus. *Gloxinia* bulbs from Belgium were infected by *Cylindrocarpon radicicola* [ibid., xi, pp. 243, 460], causing soft, black, sunken lesions. *Pelargonium* leaves showed the small, circular, brown, somewhat depressed spots typical of infection by *Bacterium pelargonii* [ibid., xi, p. 650]. *Colletotrichum* (?) *dianthi* produced black spots, 1 to 2 mm. in diameter, with a red margin on Fürst Bismarck carnation leaves, which finally withered. Studies were conducted on the graft canker of roses associated with *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: ibid., x, p. 792].

American oaks (*Quercus rubra*) at Putten were attacked by mildew (*Microsphaera quercina*) which has only once before been observed on this ordinarily highly resistant species in Holland.

Plantesygdomme i Danmark 1931. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1931. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. for Planteavl*, xxxviii, 3, pp. 349–390, 1 fig., 1 graph, 1932. [English summary.]

This report, compiled by E. Gram and his collaborators on similar lines to that of the previous year [*R.A.M.*, x, p. 704], contains the following among other items of interest. A list is given showing the number of inquiries received concerning each disease, arranged under the different crops. In addition to oats and barley, swedes, turnips, clover, and lucerne suffered from the reclamation

disease, good control of which was given by the application of copper sulphate to the soil. In many cases the condition was associated with potash deficiency, to which white spots on red clover [*Trifolium pratense*] leaves were found to be due. Grey speck was widespread among cereals, especially in north and west Jutland. The disease was found to be promoted by the use of liquid manure, saltpetre, and lime, as well as by spring tillage, and it was more severe following potatoes than swedes. Favourable results were given by soil treatment with sulphate of ammonia and manganese sulphate. Winter barley affected by this disease was simultaneously attacked by a species of *Ascochyta* new to Denmark, probably *A. graminicola* [ibid., x, p. 10]. Clover, lady's finger [*Anthyllis vulneraria*], and snail medick [*Medicago* sp.] were heavily infected by *Sclerotinia trifoliorum* [ibid., x, p. 670; xi, p. 304], the first-named being also attacked by *Typhula trifolii* and *Gloeosporium caulivorum* [*Kabatiella caulivora*: ibid., viii, p. 151; xi, p. 461].

Potato wart (*Synchytrium endobioticum*) was detected in a few localities of the Copenhagen district and elsewhere.

Among the new records for the country may be mentioned begonia mosaic; a serious bacterial disease of beans [*Phaseolus vulgaris*] investigations on which are in progress; (?) *Erwinia carotovora* [*Bacillus carotovorus*] on greenhouse parsley; *Bacterium marginatum* on gladiolus corms [ibid., x, pp. 438, 645]; *Fusarium* (?) *dianthi* [ibid., x, p. 245] on English carnations; and *Neofabraea malicorticis* [ibid., x, pp. 114, 272] on apples near Lyngby.

SMARODS (J.). **Kultūraugu slimības 1930. un 1931. g.** [Diseases of cultivated plants in 1930 and 1931.]—*Acta Inst. Defens. Plantarum Latviensis*, Riga, ii, pp. 40–43, 1932.

This is a brief annotated list (arranged by the hosts) of the more important diseases of cultivated crops and ornamental plants which were observed in Latvia in 1930 and 1931, all due to well-known parasites.

TEMPANY (H. A.). **Annual Report Department of Agriculture, Straits Settlements and Federated Malay States, for the year 1931,** 56 pp., 1932.

In 1931, the Straits Settlements and Federated Malay States Department of Agriculture in conjunction with the Rubber Research Institute organized a scheme for testing and giving official recognition to proprietary fungicides which may be safely used in the treatment of mouldy rot [*Ceratostomella fimbriata*: *R.A.M.*, x, p. 549] of the tapped bark of *Hevea* rubber. Facilities were provided for the proprietors or agents to have their preparations tested at the Rubber Research Institute, those fungicides that passed the tests satisfactorily being included in a special list.

In the section dealing with the work of the Division of Mycology [by A. Thompson] it is stated that rubber mildew (*Oidium heveae*) was negligible during the period under review, probably owing to regular rainfall after a normal winter. Other records include pink disease [*Corticium salmonicolor*], stem girdling, *Diplodia* [*Botryodiplodia theobromae*], and *Fomes lignosus* on tea; a severe out-

break of leaf disease [*Hemileia vastatrix*: ibid., x, p. 239] on Arabica coffee; *Bacillus* [*Bacterium*] *solanacearum* on tobacco in all parts of Malaya; and *Phytophthora colocasiae* causing appreciable damage to sireh vines [*Piper betle*: ibid., viii, p. 675].

THOMPSON (A.). **Mycological notes.**—*Malayan Agric. Journ.*, xx, 6, pp. 307–309, 1932.

The unidentified species of *Fomes* previously reported as associated with stem rot of oil palms [*Elaeis guineensis*] in Malaya [*R.A.M.*, xi, p. 105] was found on nearly every diseased palm examined during a period of twelve months. The fructification was usually resupinate, and appeared only when the disease had already reached an advanced stage. In attempting prevention it was found to be useless to paint the cut surface of a pruned leaf base unless the wounds caused on the leaf stalk below were also treated, as when they were opened the leaf base tissue was nearly always rotted, even though the surface of the sloped cut might appear to be healthy. The fungus mould (*Thielaviopsis*) [*Ceratostomella paradoxa*; loc. cit.] was always present in wounded leaf and stem tissue and, together with the mycelium of the above-mentioned *Fomes*, in the decaying tissue of palms affected with stem rot.

Notes are also given on *F. lignosus* on oil palms, frog eye (*Cercospora nicotianae*) and slime disease (*Bacillus* [*Bacterium*] *solanacearum*) of tobacco, a die-back of coffee twigs associated with *Gloeosporium coffeanum* [*Glomerella cingulata*: ibid., xi, p. 432], a *Mycothecium*, probably *M. advena* Sacc. growing on coffee leaves in the same pustules as *Hemileia vastatrix*, and a collar rot of tea seedlings induced by unfavourable weather and mechanical injury.

BORG (P.). **Appendix F. Report of the Plant Pathologist.**—*Ann. Rept. on the Working of the Malta Dept. of Agric. during 1931–32*, pp. xv–xix, 1932.

An early outbreak of blight (*Phytophthora infestans*) caused severe injury to the winter crop of potatoes at numerous places in Malta where the fields had not been sprayed with Bordeaux mixture. The disease reappeared in a very virulent form on the spring crop and prompt measures were taken to persuade the farmers to spray properly and at the right time. As a result, scarcely any fields of the spring crop were left unsprayed, and a large number were sprayed under the direct supervision and partly with the help of the staff of the Department of Agriculture [cf. *R.A.M.*, ix, p. 579].

WOOD (JESSIE I.). **Estimated crop losses from diseases in the United States—1928, 1929, and 1930.**—*Plant Disease Reporter, Supplement* 83, 68 pp., 1932. [Mimeographed.]

In a foreword to this compilation N. E. Stevens states that the method adopted to enable a computation of the crop losses to be made is as follows. The actual production is taken to represent 100 per cent. minus the sum of the percentages of loss from all diseases of the crop in question. The possible production is

obtained by dividing the actual production by 100 per cent. minus the total percentage of loss from all diseases of the crop. Thus possible production

$$= \frac{\text{actual production}}{\text{100 per cent.} - \text{per cent. loss from all diseases of crop.}}$$

The percentage loss for the United States is obtained by dividing the total reduction in yield (sum of the State losses) by the possible production for the country. The detailed figures to enable these calculations to be made are provided for a number of the more important crops of the United States in a series of tables, covering the three years from 1928 to 1930.

The total wheat production in the United States in 1928, 1929, and 1930 amounted to 902,749,000, 806,508,000, and 850,965,000 bushels, respectively, the losses from all diseases in the same years being estimated at 67,637,000, 64,532,000, and 41,433,000 bushels, respectively. The total maize production in 1928, 1929, and 1930 amounted to 2,839,959,000, 2,622,189,000, and 2,081,048,000 bushels, respectively, the losses from disease during the same years reaching 237,028,000, 211,809,000, and 122,682,000 bushels, respectively. The potato yields in 1928, 1929, and 1930 were 462,943,000, 357,451,000, and 361,090,000 bushels, respectively, the losses for the three years in question being estimated at 118,927,000, 50,163,000, and 69.843,000 bushels, respectively.

Details of the losses due to the chief individual diseases are included in the tables.

BARRUS (M. F.), BOYD (O. C.), & WOOD (JESSIE I.). **Diseases of plants in the United States in 1930.**—*Plant Disease Reporter, Supplement* 81, 135 pp., 25 maps, 1931. [Mimeographed. Received September, 1932.]

This report, prepared on the same lines as the foregoing [*R.A.M.*, x, p. 81], contains copious notes, supplemented by 64 tables and a number of maps, on the incidence of disease among cereal, forage, fruit and nut, vegetable, and 'special' crops (cotton, hops, and sugar-cane), ornamentals, and trees.

[TISDALE (W. B.)]. **Plant pathology.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30th, 1931*, pp. 105–123, 1931. [Received September, 1932.]

Further studies conducted in Florida into the control of gummosis and psorosis of citrus trees [*R.A.M.*, xi, p. 365] showed that the early stages of both can be controlled fairly readily on orange and grapefruit trees by scraping the affected parts and smearing with a disinfectant paste. On tangerines [*Citrus nobilis* var. *deliciosa*], however, which apparently develop psorosis only, the disease is much more difficult to control, and often quickly breaks out in advance of the places treated even though they are scraped well beyond the margin of the diseased area. Under Florida conditions psorosis, contrary to its reputed behaviour in California, frequently develops with great rapidity. Cultures from the discoloured areas of the inner bark in advance of lesions

of gummosis on grapefruit trees and psorosis on tangerines, in most cases where any organism developed at all, yielded *Diplodia natalensis*.

During the winter of 1930–1 numerous isolations showed that most of the stem-end rot of citrus in Florida was due to *Phomopsis citri* [ibid., x, p. 226]. Out of 185 grapefruit 'buttons' tested, about 8 per cent. yielded pure cultures of this fungus. Evidence was secured that *P. citri* has already penetrated into the buttons when the fruit is harvested.

Controlled inoculation experiments have confirmed field observations that certain tomato varieties are resistant and others susceptible to nail-head spot (*Macrosporium* [*Alternaria*] *tomato*); immature fruits were more susceptible than fully grown ones. Spore measurements were found to be unsatisfactory for distinguishing *A. solani* from *A. tomato* [ibid., xi, p. 680] on tomato plants, but other morphological characters of the spores appeared to be sufficiently constant to differentiate the two species microscopically.

Further investigations into the leaf spot of tomatoes caused by *Stemphylium* [*solani*: ibid., ix, p. 812] showed that the fungus remained viable at room temperature for 14 months.

A wilt of strawberries was observed in Florida in 1930, starting from the older leaves and extending to the youngest, the plants wilting during the day and recovering at night for a few days, after which they succumbed. The affected leaves appeared as if scalded, and the disease was most conspicuous in warm weather. Numerous isolations were made from infected material, 75 per cent. of which yielded species of *Fusarium*, the causal connexion of which with the disease, however, has not yet been established.

In March, 1931, a new strawberry disease which has been termed 'crepe leaf' was observed on Blakemore plants from Arkansas. The affected leaves were crinkled and had narrow, sunken, chlorotic areas, producing a mosaic pattern on the apical third of the leaf blade. The green areas were mostly abnormally dark.

The most effective method of producing brown spot of maize (*Physoderma zeae-maydis*) in the field was to pour a water suspension of the sporangia into the tops of the plants when 3 to 4 feet high. The time required for the disease to develop in plants thus inoculated was 16 days. The disease is usually present in the leaves and stalks below the ear. Sporangia kept for two years under various conditions in the field and in the laboratory retained their virulence. Greenhouse inoculation tests demonstrated that brown spot is not seed-borne. The reaction of inbred lines to artificial inoculation in the greenhouse was no indication of their reaction to the disease under field conditions. Inoculations on the following grasses failed: gama grass [*Tripsacum dactyloides*], Job's tears [*Coix lacryma-jobi*], sweet sorghum, Sudan grass [*Andropogon sorghum* var. *sudanensis*], broomcorn [*A. sorghum* var. *technicus*], everglade millet [*Setaria magna*], foxtail millet [*S. italica*], pearl millet [*Pennisetum typhoideum*], green foxtail [*S. viridis*], and yellow foxtail [*S. glauca*].

Physalospora zeicola Ell. et Ev. was ascertained to be the perfect stage of a *Diplodia* also parasitic on maize.

BURKHOLDER (W. H.). **Carbohydrate fermentation by certain closely related species in the genus Phytomonas.**—*Phytopath.*, xxii, 8, pp. 699–707, 1932.

The capacity of nine species and varieties of phytopathogenic bacteria to ferment 24 carbohydrates was investigated. The organisms used, all of which are referred to the genus *Phytomonas* [*R.A.M.*, iii, p. 18], were *Pseudomonas campestris*, *Bacterium juglandis* [ibid., xi, p. 338], two strains of *Bact. malvacearum*, two strains of *Bact. phaseoli*, one from New York and one from Switzerland, two strains of *Bact. phaseoli* var. *fuscans*, both from Switzerland [ibid., ix, p. 695], *Bact. phaseoli* var. *sojense*, *Bact. vascularum*, *Bact. vesicatorium*, and *Bact. vitians* [ibid., ix, p. 224].

A synthetic peptone-free base was used to which the various carbohydrates were added, the medium being adjusted to P_H 7. The organisms to be tested were first grown on beef extract agar for some 48 hours and then transferred to the carbohydrate media incubated at 27° C.

Contrary to Lewis's observation, one of the strains of *Bact. malvacearum* was able to ferment arabinose [ibid., ix, p. 715]. *Bact. phaseoli* var. *fuscans*, *Bact. vascularum*, and *Bact. vitians* differ from the other members of the group in their incapacity to ferment maltose, the last-named being also unable to hydrolyse starch. *Bact. vascularum* is incapable of utilizing arabinose, lactose, and glycerol. *Bact. phaseoli* var. *sojense* is distinguishable from *Bact. phaseoli* by its capacity to ferment mannitol. In the case of *P. campestris*, *Bact. juglandis*, *Bact. phaseoli* var. *sojense*, and *Bact. vesicatorium* separation is less easy. *Bact. malvacearum* is distinguishable from *Bact. phaseoli* only by its incapacity, as a general rule, to ferment arabinose, and here, as mentioned above, certain anomalies occur.

The plant pathogens under investigation were found to be capable of utilizing the salts of acetic, citric, malic, and succinic acids, from which a considerable amount of alkali was formed in solutions of only 0·15 per cent. of the salt.

JOURNÉE (C.) & LAROSE (E.). **Quelques résultats d'essais sur variétés de Froment.** [Some results of trials with Wheat varieties.]—*Bull. Inst. Agron. et des Stat. de Recherches Gembloux*, i, 1, pp. 19–34, 7 graphs, 1932. [Flemish, German, and English summaries.]

In connexion with a series of experimental studies on different wheat varieties at the Plant Improvement Station, Gembloux, Belgium, it was ascertained that yellow rust (*Puccinia glumarum*) is most severe on the early maturing Institut de Gembloux, 18 A and 18 B, Vilmorin 23, and others of a similar type. Most of the Japanese varieties used in the tests succumbed to this disease, but Akabozu and Shirohada proved highly resistant to *P. glumarum* as well as to cold. On the other hand, the foot rot and straw-breaker fungi (*Ophiobolus graminis* and *Leptosphaeria culmifraga*) [*R.A.M.*, ix, p. 236] caused the heaviest damage on the late ripening varieties, such as Champion.

KIRCHHOFF (H.). **Über den Einfluss der Keimungstemperatur und anderer Keimbettfaktoren auf das Verhalten gebeizten Getreides.** [On the influence of the germination temperature and other seed-bed factors on the development of disinfected cereal seed-grain.]—*Angew. Bot.*, xiv, 4, pp. 349–389, 2 graphs, 1932.

In continuation and extension of the work of Gassner and others on the influence of germination temperature and cognate factors on the development of cereal seed-grain treated with various disinfectants [*R.A.M.*, v, p. 540 *et passim*], the writer carried out a series of laboratory tests at the Brunswick Technical College.

The results of the experiments [which are fully tabulated and discussed] showed that the germination of wheat was least affected by steeping in germisan (1 hour at 2, 4, or 8 per cent.), uspulun (6 hours at 2 or 4 per cent.), arsenic acid (1 hour at 0·1, 0·2, or 0·4 per cent.), and dusting with abavit (9·40 gm. per kg. seed-grain) when the seed-bed (sand) was kept at a low temperature (10° C.), the reverse being the case with formaldehyde (1 hour at 0·4 or 0·8 per cent.) and copper sulphate (1 hour at 2 or 4 per cent.) solutions, and ceresan, tutan, tillantin R, and corrosive sublimate dusts (13·40, 13·40, 9·40 and 9·40 gm. per kg., respectively), which gave better results at 20° and 24° than at 10°. Generally speaking, a low soil moisture content (20 per cent. of the water-holding capacity) resulted in greater injury to germination than a high one (80 per cent.), and a combination of low temperature and low soil moisture was particularly unfavourable in some cases (e.g., with ceresan). The deleterious action of the disinfectants was strengthened by lack of oxygen in the seed-bed. In some cases, e.g., with germisan, this effect was neutralized by exposing the sand in which the seed was sown to a current of oxygen for 24 hours, whereas in others, uspulun for instance, no such benefit was derived. The exposure of the treated seed-grain to carbon dioxide for the first four days after disinfection generally reduced the percentage of germination but curtailed the duration of the process in comparison with the untreated controls. An increase of germination was effected in seed-grain treated with germisan or copper sulphate by watering the sand with Knop's solution or potassium nitrate, and in tutan-treated seed-grain with magnesium sulphate also. Germination was reduced, on the other hand, by Knop's solution following treatment with ceresan, and by potassium nitrate and magnesium sulphate after disinfection with arsenic acid. An acid soil reaction tended to increase the injury from seed treatment.

RABIEN (H.). **Beitrag zur Frage der Schädigung des Saatgutes durch Trockenbeizen.** [Contribution to the question of injury to the seed-grain by disinfectant dusts.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 8, pp. 61–62, 1 fig., 1932.

Complaints having been received of serious damage to Carsten's Dickkopf V wheat in the Brunswick district of Germany as a result of treatment of the seed-grain in November, 1931 with abavit B, the following experiment was carried out. Carsten V

seed-grain was treated with three different samples of abavit B (0·2 gm. per 100 gm. seed-grain) and sown (*a*) in the greenhouse at 18° C. and (*b*) in a cold chamber at the Brunswick Institute of Agricultural Botany at 0° to 3° (4th May). No damage to the (*a*) series was observed, but the germinative capacity of the (*b*) seedlings was found, three days after transference to a temperature of 15° (14th July) to have been reduced from 95·5 to 35·5, 38, and 26·5 per cent., respectively, by the three samples of abavit B. The corresponding figures on 22nd July were 97·5 per cent. for the untreated and 96, 91, and 90 per cent., respectively, for the lots treated with abavit B. Further tests with abavit B gave comparable results and further showed that treatment with this substance results in a considerable reduction in the dry weight of the plants. No such adverse effects followed treatment of the seed-grain with germisan (short disinfection process) or tillantin R.

BODNÁR (J.) & ROTH (LILI E.). **Die Wirkung der Quecksilbersalze auf die Samenkeimung.** [The action of mercury salts on seed germination.]—*Biochem. Zeitschr.*, ccxlviii, 4–6, pp. 375–382, 1931.

The writers carried out experiments at the Institute of Plant Biochemistry, Budapest, on the effect of some simple mercury salts on the germination of wheat seed-grain.

It was found that the mercury ions of mercuric nitrate, mercuric sulphate, and mercuric acetate exert scarcely any action, while the lipoid compounds of mercuric chloride, mercuric bromide, and mercuric acetate adversely affect germination, especially those of mercuric bromide. The effect of the alkalihaloid (alkali chloride and bromide) salts in reducing the injury of the lipoids to the seed-grain may be attributed to the diminution of the lipoid mercury content of the mercuric chloride and mercuric bromide solutions through the formation of the complex salts, mercury methyl chloride and mercury methyl bromide. The injury-reducing action of the potash salts is greater than that of sodium. The slight harmful effect of mercuric acetate is enhanced by the addition of a little sodium chloride but minimized by more of this compound.

These data are considered to be irreconcilable with the theory of Krönig and Paul (*Zeitschr. für Hyg.*, xxv, 1, 1897) that the toxicity and disinfectant action of mercury salts is due to their dissociation.

ROEMER (T.) & KAMLAH (H.). **Gibt es eine selektive Wirkung der Wirtspflanze (Weizen) auf den Pilz (Ustilago)?** [Is there a selective action of the host (Wheat) on the fungus (*Ustilago*)?]—*Phytopath. Zeitschr.*, v, 1, pp. 41–53, 1932.

In continuation of the investigations initiated by Grevel on the occurrence of physiologic strains in loose smut of wheat (*Ustilago tritici*) [*R.A.M.*, ix, p. 708], the authors tested the reaction of some standard varieties to a collection from Halle (1) and three from Kleinwanzleben (Peragis, 187, and 368/20), the last-named being the most virulent hitherto found in Germany [ibid., xi, p. 666]. In general the results of the studies [which are fully tabulated and discussed] confirmed those obtained by Grevel and indicated that the

virulence of the fungus is greatly influenced by the selective action of the host. By means of crosses between resistant and susceptible varieties it was found possible to develop summer wheats immune from strains 1 and 2 of *U. tritici*. These hybrids combine the characters of Grüne Dame and Peragis on the one hand with those of the Bordeaux type (including Rimpau's Roter Schlanstedter) on the other.

HANNA (W. F.), VICKERY (H. B.), & PUCHER (G. W.). **The isolation of trimethylamine from spores of Tilletia levis, the stinking smut of Wheat.**—*Journ. Biol. Chem.*, xcvii, 2, pp. 351–358, 1932.

Experiments are described which showed, in agreement with the field observations of one of the authors, that of the two species of *Tilletia* responsible for wheat bunt, *T. tritici* and *T. levis* [*T. caries* and *T. foetens*], the latter alone produces the fishy odour commonly associated with this disease. Trimethylamine, to which the authors attribute the odour, was isolated from spores of the latter but was not detected in those of *T. caries*.

PETERSEN (W.). **Vier Jahre genossenschaftliche Getreidereinigung und -beizung.** [Four years of co-operative seed-grain cleaning and disinfection.]—*Ratschläge für Haus, Garten, Feld*, vii, 8, pp. 116–118, 1 fig., 1932.

Co-operative cleaning and disinfection of cereal seed-grain has been practised at Heckelberg, Mark Brandenburg, for the last four years [cf. *R.A.M.*, xi, p. 707], some two-thirds of the winter and one-third of the summer wheat crop being treated. Many farmers are now also treating the rye seed-grain before sowing owing to the increasing prevalence of foot rot [*Fusarium* spp.] in the district of recent years [cf. ibid., x, p. 94]. Barley is almost always disinfected against stripe [*Helminthosporium gramineum*]. Ceresan has given excellent results, applied by means of one of the continuous dusting attachments to the seed-cleaning apparatus [shown by a photograph]. The cost of the treatment is only Pf. 50 per cwt.

STEGEMANN. **Zur Frage der Fusskrankheiten.** [On the question of the foot rots.]—*Deutsche Landw. Presse*, lix, 35, p. 442, 1932.

Commenting on the devastating incidence of foot rot of wheat [*Ophiobolus graminis*] in Schleswig-Holstein during the current year [*R.A.M.*, xi, p. 361], the writer observed that infection was prevalent in crops following a mixture of vetch [*Vicia* spp.] and oats, which is not ordinarily the case. The diseased areas were found to cover only the sites where the vetch had been stacked in the previous year.

ZEINER (W.). **Das Verhalten verschiedener Sommergerstenkreuzungen hinsichtlich der Anfälligkeit für Ustilago nuda.** [The behaviour of various summer Barley hybrids in respect of susceptibility to *Ustilago nuda*.]—Reprinted from *Zeitschr. für Züchtung*, A, xvii, 3, 40 pp., 2 figs., 5 graphs, 1932.

Using Piekenbrock's adaptation of Seiffert's method [*R.A.M.*, vii,

p. 435; xi, p. 710] for the artificial inoculation of barley with loose smut (*Ustilago nuda*) the writer infected 193,000 flowers during the period from 1926 to 1930 in Württemberg, and thus secured 85,000 plants for the determination of infection percentages, the data being fully tabulated and discussed. The best results were obtained by inoculation from five to seven days after the commencement of flowering, under favourable conditions for the germination of the spores. The spores of *U. nuda*, stored in cardboard boxes in the laboratory, were found to retain their viability for over a year. The average loss in the stand of plants from infected seed during 1927–8 was 44·5 per cent., chiefly due to the greatly weakened condition of the seeds from the inoculated flowers. By means of typical alterations in the young ears, e g., elongated growth and partial or total absence of awns, diseased plants may be differentiated from healthy ones some 14 days before the emergence of the spikes [ibid., x, p. 782].

Seiffert observed a high degree of resistance to *U. nuda* in barley varieties of the *inaequale* type, and the writer noticed a similar reaction in Tiroler Nackte 898/21, Blaue Nackte, and Walpersii (all *Hordeum inaequale nudum* varieties), whilst the Australian early, Heil's Franken, and Heine's Hanna (all *H. distichum nutans* vars.) and also Heine's four-rowed (*H. inaequale*) were susceptible, the first-named particularly so. Genetic studies of eight crosses indicated that immunity, resistance, or slight susceptibility to loose smut are consistently inherited according to the Mendelian rules. In cross IV (the moderately susceptible Heil's Franken × the highly susceptible Australian early) transgressive segregation in the direction of greater susceptibility was apparent. Except in cross V (Heil's Franken × Walpersii), in which two factors are involved, resistance of whatever degree was conditioned by one Mendelian factor. The factors for resistance or slight susceptibility are inherited separately. Though the evidence on this point was not conclusive, the indications were that resistance is dominant. There was no indication of transgressive segregation in the direction of resistance in a cross between the two susceptible varieties, Heine's Hanna and Australian early.

The best means of procuring valuable immune selections was found to be by crossing immune or highly resistant varieties with otherwise desirable susceptible sorts. Walpersii and Blaue Nackte can both be recommended as parents, except for the blue coloration of the aleurone layer of the seeds in the latter variety, a character that is frequently inherited by the progeny.

HEWLETT (C. H.) & HEWLETT (J. H.). **Hot-water treatment of seed Barley.—Crop results in Canterbury, seasons 1930, 1931, 1932.**—*New Zealand Journ. of Agric.*, xlv, 2, pp. 104–108, 1932.

In this further report on the results of hot-water treatment of barley seed grain for control of covered smut [*Ustilago hordei*: *R.A.M.*, ix, p. 516] in New Zealand, it is stated that in 1931 some growers reverted to the old system of using their own seed, instead of the smut-free pure strains of barley available to them. One-

third of such crops showed distinct traces of covered smut, which seriously lowered the quality of the grain for milling purposes.

EGLĪTS (H.) & EGLĪTS (M.). **Rudzu ziemošanas apstākli un neražas cēloņi 1930/31 g.g.** [Overwintering conditions of Rye and the causes of crop failure in 1930–31.]—*Acta Inst. Defens. Plantarum Latviensis*, Riga, ii, pp. 33–39, 1932. [German summary.]

An extensive enquiry among rye-growers in Latvia in 1931 elucidated the fact that by far the greatest cause of the failure of the crop in that year was the snow fungus (*Fusarium* sp.) [*Calonectria graminicola*], the development of which was favoured by the prolonged persistence of a deep snow cover late into the spring. It is pointed out that less than half of the growers had treated their seed grain against the disease, and in spite of the fact that in most cases the treatment was only partial, 72 per cent. of their number had markedly better stands in the spring than where the grain was not treated, this again demonstrating the practical value of seed disinfection. In field tests at three experiment stations, the best result was obtained with ceresan dust, closely followed by the short steeping process with germisan. Sprinkling the seed with germisan, Preparation No. 1, and rye fusariol was much less effective. There was some indication of a correlation between the type of the soil and the incidence of winter injury, since the rye suffered most on light and least on heavy soil.

ROLDAN (E. F.). **Pythium root-rot disease of Corn in the Philippine Islands.**—*Philipp. Agric.*, xxi, 3, pp. 165–176, 4 figs., 1932.

Field observations on the root rot of maize in the Philippines previously reported as due to a species of *Pythium* [*R.A.M.*, x, p. 96] showed that the losses from this cause under favourable conditions for the disease may range from 25 to 35 per cent. of the stand of susceptible varieties. Inbred plants of the Native Yellow Flint and White Dent types appear to suffer most. The disease is characterized by a pale yellow discoloration of the foliage, wilting, and rotting of the shanks by secondary saprophytic organisms just above soil level, resulting in the collapse of the plants. The roots die back and later the entire rootstock and a portion of the shank may be involved, the latter assuming a water soaked aspect and emitting an offensive odour.

The fungus isolated from diseased material was found to differ from the closely allied *P. arrhenomanes* [ibid., viii, p. 168; xi, p. 434] in the following particulars. The hyphae of the Philippine species are 1·5 to 4·5 μ in width, compared with 2 to 5 μ in *P. arrhenomanes*; the lobulate sporangia (12 to 15 μ in diameter as against 20 μ) germinate by means of a germ-tube and not by zoospores; the oogonia measure 22 to 39 μ (24 to 35 μ in *P. arrhenomanes*), the antheridia 11 to 23 by 7 to 10 μ (12 to 25 by 6 to 9 μ), and the oospores 21 to 35 μ (22 to 33 μ) in diameter; the number of antheridia in the Philippine species is probably not more than 11, compared with a probable total of 25 or more in *P. arrhenomanes*. On the basis of these differences the Philippine organism

is regarded as a new variety (*philippinensis*) of *P. arrhenomanes*. The comparative measurements of the two fungi are shown in a table, in which some morphological particulars of *P. aphanidermatum*, *P. butleri*, and the Hawaiian sugar-cane *Pythium* [ibid., viii, p. 740 *et passim*] are also included.

Inoculation experiments on maize under controlled conditions resulted in the development of the typical symptoms of root rot. The fungus further readily attacked the roots of sugar-cane and caused slight infection on rice, while little or no injury was produced on ginger, tobacco, and papaw, and the results on mungo beans [*Phaseolus mungo*] and cowpea were entirely negative.

Control measures, based on suitable cultural methods and crop rotation, are briefly indicated.

SENN (P. H.). **The effect of the sugary gene in Corn on resistance to seedling blight caused by Gibberella saubinetii.**—*Phytopath.*, xxii, 8, pp. 675–697, 2 figs., 1932.

Observations in Wisconsin and reports from elsewhere indicate that sweet corn is more severely affected by several diseases than the dent varieties and a study was accordingly made on the effect of the sugary gene in maize on resistance to the seedling blight caused by a single physiological form of *Gibberella saubinetii*. The sugary character is known to be recessive to the non-sugary or starchy one and comparative tests of resistance were made between the sweet and starchy kernels produced on the same segregating ears in heterozygous selfed and crossed plants. Preliminary experiments showed that sugary and non-sugary kernels were equally likely to contain not only *G. saubinetii*, but also other seed-borne organisms such as *Penicillium*, *Rhizopus*, and *Basisporium* [*gallarum*: *Nigrospora sphaerica*: *R.A.M.*, xi, pp. 447, 448]. In the resulting seedlings, however, every group of segregating ears yielded a higher index of resistance to *G. saubinetii* blight in the plants from the non-sugary kernels; when the seedlings were weak, though those from the non-sugary kernels were more resistant, the difference was scarcely significant.

No evidence was obtained that the presence of the other seed-borne organisms mentioned above affected the resistance of the seedlings to *G. saubinetii*.

It is evident from these results that the sugary gene is at least one of the factors responsible for the disparity in resistance to seedling blight shown by the two kernel types. The sugary gene in itself lowers resistance to seedling blight and hence is a limiting factor in the development of a sweet maize possessing the same high degree of resistance found in certain strains of the starchy type.

MORWOOD (R. B.). **Report of Maize Diplodia experiments 1930–31.**—*Queensland Agric. Journ.*, xxxviii, 1, pp. 22–23, 1932.

An experiment conducted in Queensland showed that maize seed-grain slightly infected with *Diplodia* [*zeae*: *R.A.M.*, x, p. 223] and treated with tillantin R gave a better yield but no better germination than did similarly infected, untreated seed.

FAWCETT (H. S.). **Two Phytophthoras of Citrus found in new localities.**—*Plant Disease Reporter*, xvi, 12, p. 130, 1932. [Mimeographed.]

In January, 1932, *Phytophthora citrophthora* was isolated from oranges affected by brown rot in very wet soil near Wildwood, and from grapefruit in wet irrigation ditches near Vero Beach and Palmetto, Florida. It was also isolated from oranges taken from the orchards and a packing house at Buras, Louisiana. Probably the fungus has been present for a long time in these States, but this is the first report of its occurrence.

In February, 1932, *P. hibernalis* [see next abstract] was isolated from oranges showing symptoms identical with those of the brown rot due to *P. citrophthora* near Cucamonga, California. Both fungi were identified by S. F. Ashby.

PITTMAN (H. A.). **Brown rot of Citrus. A serious disease that can be easily prevented.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., ix, 2, pp. 286–289, 1932.

The author states that until recently brown rot injury to *Citrus* spp. (chiefly oranges and tangerines) in Western Australia was mainly caused by *Phytophthora hibernalis* [*R.A.M.*, x, p. 161 and preceding abstract], but since 1930 the brown rot caused by *P. citrophthora* [ibid., viii, p. 640] (and which is locally termed 'Californian' to distinguish it from the former) has become of considerable importance, especially on lemons. In the author's opinion, this has been brought about by the neglect of spraying by the growers, a practice which he considers as essential in routine work as manuring or proper cultivation. The *P. hibernalis* form of rot, which occurs mainly during the cold winter weather, can be readily prevented by spraying the lower two-thirds of the trees in the autumn, before the onset of rains, with 5–5–50 home-made Bordeaux mixture or with a mixture prepared from a good commercial ready-made Bordeaux powder at the rate of 1 lb. to 5 gall. water. A similar spraying during the winter or very early in the spring gives good control of the 'Californian' form. It is recommended that the trunks should be well drenched with the spray to guard against *P. citrophthora* gummosis [ibid., x, p. 450] which was found on the trunks of citrus trees, especially lemons, in several orchards of the State. Spraying the soil around the trees is beneficial both by keeping down sources of infection, which is carried from year to year in diseased citrus tissues in the soil, and also owing to the stimulating effect of copper sulphate on the trees. Control of the diseases is facilitated by removing all excess branches, so as to ensure good penetration of air and light to the centre of the crown, and also by the removal of low branches which tend to drag on the ground, so as to leave at least a foot of clear space above the ground all around the tree.

Both forms of brown rot occur with much greater severity on heavy clay soil with a high moisture content than on lighter and better drained soils, for which reason drainage should be improved where it is defective.

The paper also gives a brief description of the leaf and fruit symptoms, which are very much the same for both organisms.

NOBLE (R. J.). **Australia: a disease of Citrus recorded in New South Wales for the first time.**—*Bull. Internat. Inst. Plant Protect.*, vi, 8, p. 131, 1932.

A species of *Septoria*, probably *S. depressa* recorded by McAlpine on oranges and lemons in Victoria in 1899, has been observed for the first time last season in New South Wales on the fruit and foliage of the same hosts. Only one small isolated area is affected at present, but the disease appears to be of potential importance.

DAVIDSON (J.). **Some observations on the causes of the surface blemishes of Oranges in South Australia.**—*Journ. Dept. Agric. S. Australia*, xxxv, 12, pp. 1381–1387, 2 pl., 1932.

This is a brief account of a preliminary investigation which indicated that the surface blemishes other than those caused by fungi, which were observed on oranges during the 1931–2 season in South Australia, may be divided into three classes, namely, (*a*) those due to weather conditions, particularly the action of the wind in causing the fruit to be rubbed against leaves, twigs, and the like, at various stages of its development; (*b*) those caused by insects; and (*c*) those caused by the escape of oil from the oil vesicles in the rind following injury from the first two causes. The paper terminates with a brief discussion of the measures which may lead to the control of these troubles.

STEVENS (F. L.). **Two fungous invasions often following the Coconut leaf miner, Promecotheca cumingii Baly.**—*Philipp. Agric.*, xxi, 2, pp. 80–82, 2 figs., 1932.

Coco-nut leaves in the Philippines are liable to infection by two fungi, which frequently follow invasion by the leaf miner (*Promecotheca cumingii*), viz., *Pestalozzia palmarum* [*R.A.M.*, x, p. 79] and *Epicoccum cocos* n. sp.

The dull silver-coloured, oval lesions of *P. palmarum* usually measure 12 by 6 mm. in diameter but may reach 18 mm. in length; they are heavily studded with punctiform or elongated, black acervuli, usually on the upper surface but occasionally on the lower tan-coloured one. Each spot is sharply bordered by a honey-coloured rim, and they often centre round a wound due to oviposition of the leaf miner and subsequent parasitization of the egg or larva. When *P. palmarum* invades the leaf through the insect channels it forms rectangular spots of variable extent.

E. cocos n. sp. produces numerous dark tan-coloured to brown spots, 2 by 3 or up to 18 by 6 mm., bordered by a brown line. The black, globose sporodochia, 75 to 120 μ in diameter, are usually hypophyllous, occasionally epiphyllous, and are often unequally distributed over the spot; they occupy more than half the stomata in the affected region and the underlying tissue is densely packed with mycelium. The conidiophores are septate and much branched, and form by union of their bases a pseudoparenchymatous central region of the sporodochium. The smooth, brown, globose to ovate conidia, slightly pointed at one end, measure 3 μ in diameter (6 by 3 μ when ovate) and are formed terminally on short branches.

HUSAIN (M. A.). **Leaf-curl in Cotton and other plants.**—*Nature*, cxxx, 3278, p. 312, 1932.

The title of Mathur's recent communication 'Leaf-curl of Cotton in garden Zinnias in North India' [*R.A.M.*, xi, p. 573] suggests that the virus causing leaf crinkle of cotton in the Sudan is identical with that responsible for a similar condition in zinnias at Dehra Dun, a fact that has not yet been established.

Leaf curl or crinkle is stated to be common in the Punjab on potato, tomato, chilli [*Capsicum annuum*], cucurbits, and other plants, but so far no leaf crinkle has been found on cotton associated with *Bemisia gossypiperda*, although scarcely a leaf is free from whitefly infestation. Definite evidence as to the identity of the virus should be obtained in order to avoid confusion between crinkle in cotton and analogous conditions in other plants.

DHARMARAJALU (K.). **A study of the pathological anatomy of the Cotton plant in connection with the wilt disease.**—*Indian Journ. Agric. Sci.*, ii, 3, pp. 293–313, 2 pl., 21 figs., 1932.

Tested on the primary radicle of germinated seeds of three cotton varieties, susceptible (Dharwar I), resistant (Dharwar II), and immune (Gadag I), the mode of entry and early stages of the progress of the wilt fungus (*Fusarium vasinfectum*) [*R.A.M.*, xi, p. 453] were found to be identical. Penetration of the main (tap) root occurs through the epidermis behind the growing point, apparently by mechanical pressure, and the hyphae reach the protoxylem by about the eighth day after inoculation in the susceptible variety. In the other two varieties a layer of cork is formed at the point of infection and the outer epidermal walls become suberized, but the hyphae were able to penetrate into the cortex as before, reaching the endodermis on the eighth day and the xylem shortly after.

The susceptible Dharwar I was found to become resistant at temperatures above 32° C., whereas the resistant Dharwar II became susceptible below 25°, and even Gadag I showed a slight degree of infection at the lower temperature. Under the latter conditions the inoculated plants of all three varieties showed suberization of the epidermal and cortical cell walls (one or two layers), while a small amount of peripheral cork also developed more prominently under the points of infection; the controls showed suberization only of the epidermal walls. At higher temperatures (32° to 34°) there was no mortality among the Dharwar II and Gadag I plants. At these temperatures the peripheral cork was thick in the infected roots of all varieties, and not only was suberin formed in advance of invasion by the fungus in the epidermal and cortical cells, but the cell contents were more or less disorganized in all the varieties.

It is concluded that the development of peripheral cork and wall suberization, though highly important, are not the main causes of resistance to cotton wilt, which appears to reside mostly in the nature of the host protoplasm.

VOUK (V.) & KLAS (ZORA). **Über einige Kulturbedingungen des insektentötenden Pilzes Metarrhizium anisopliae (Metsch.) Sor.** [On some factors affecting the culture of the insectivorous fungus *Metarrhizium anisopliae* (Metsch.) Sor.]—*Acta Bot. Inst. Bot. Univ. Zagrebensis*, vii, pp. 35–58, 2 figs., 1 graph, 1932.

Laboratory experiments [the results of which are fully discussed and tabulated] at Zagreb, Jugo-Slavia, showed that the temperature range for the normal growth of the insectivorous fungus, *Metarrhizium anisopliae* [*R.A.M.*, xi, p. 456], is relatively limited (10° to 30° C.), the optimum for growth and fructification occurring at 24° to 26° and the thermal death point lying between 55° and 60°. Development took place at a range of hydrogen-ion concentrations from P_H 4·7 to above 10, with an optimum at 6·9 to 7·4. Both organic and inorganic nitrogen were utilized by *M. anisopliae*, the sources of the former including peptone (specially favourable to growth) and asparagin and of the latter ammonium sulphate, ammonium nitrate, and potassium nitrate. Carbon was obtained from glycerine and a number of carbohydrates, namely, glucose, levulose, arabinose, galactose, saccharose, and inulin. Light arrests the growth of the fungus, which further requires a considerable degree of moisture for its development. Mass cultures of *M. anisopliae* are readily obtainable on boiled rice, 1 sq. cm. of the surface of the medium yielding 0·3258 gm. of spores, or approximately sufficient, when mixed with starch in the proportion of 10:1, for the dusting of one full-grown maize plant against the European corn borer [*Pyrausta nubilalis*]. Thus, 3 kg. of spores would be enough for two treatments of a field containing some 100,000 plants.

ALMEIDA (F. P.). **Considérations sur les genres Coccidioides immitis et Pseudococcidioides mazzai.** [Some reflections on the genera *Coccidioides immitis* and *Pseudococcidioides mazzai*.]—*Comptes rendus Soc. de Biol.*, cx, 17, pp. 137–138, 1932.

From a study of the relevant literature [which is briefly summarized], together with the comparative examination of cultures of *Coccidioides immitis* and *Pseudococcidioides mazzai* [*R.A.M.*, vii, p. 719; xi, p. 643], the writer is convinced that these organisms are substantially identical. *P. mazzai* therefore should become a synonym of *C. immitis*.

FALCHI (G.). **Recherches sur les dermatomycoses. Note 1e. A propos du polymorphisme de certains Dermatophytes.** [Researches on dermatomycoses. First note. On the polymorphism of certain Dermatophytes.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iv, 3, pp. 80–87, 1932.

When *Trichophyton gypseum* var. *farinulentum* from pus and hair, respectively, was grown on identical media at laboratory temperature the culture obtained from the hair became after 20 days markedly different from that obtained from the pus. The former showed numerous conidial clusters, fertile hyphae with aleuria, delicate mycelial spirals, and indications of spindle formation; the latter, on the other hand, showed a more pronounced

mycelial development, with fewer conidial clusters and spindles, revealing a distinct tendency to assume the normal appearance of this phase of pleomorphism. After the first transfer, both cultures grew slowly and regularly. That taken from the hair appeared to be normal, i.e., showed a slightly depressed central hump and a finely pulverulent star-formation, while the culture from pus showed a very irregular, undulating central hump. After the third transfer, the two cultures became almost alike, and after the fourth they were in all respects identical. When inoculated into guinea-pigs the two original cultures produced quite distinct symptoms, whereas when those from the fourth transfer were used normal symptoms developed in every case.

Similar differences were observed with *T. rosaceum* and *T. faviforme album* [*T. album*: *R.A.M.*, xi, p. 373].

In view of these facts the author emphasizes the need for caution in establishing new species based on characters that may be only transitory and due to the special conditions of the environment.

FALCHI (G.). **Recherches sur les dermatomycoses. Note IIe: Sur la possibilité de démontrer la présence d'éléments mycéliaux dans l'exsudat des trichophyties inflammatoires (folliculites, kérion).** [Researches on dermatomycoses. Second note. On the possibility of demonstrating the presence of mycelial elements in the exudate of inflammatory trichophytoses (folliculitis, kerion).]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iv, 3, pp. 88–92, 1932.

In the pus accompanying inflammatory trichophytoses (*Trichophyton* spp.) the author found conidia present, an observation which he states he has not seen previously recorded. As the lesions healed, the conidia became progressively fewer, being eliminated by the high phagocytic power of the leucocytes (histiocytes). The importance of these studies in the diagnosis of skin diseases of this type is discussed.

NEGRONI (P.). **Constatation du Trichophyton areolatum Negroni en Argentine.** [The detection of *Trichophyton areolatum* Negroni in the Argentine.]—*Comptes rendus Soc. de Biol.*, cx, 17, pp. 139–140, 1932.

In December, 1931, the writer isolated from the scalp of an Argentine child the same species of *Trichophyton* as that obtained by him from a similar case in 1929 in Sabouraud's laboratory in Paris, namely, *T. areolatum* [*R.A.M.*, ix, p. 182]. The colonies on Sabouraud's medium are sharply divided by a circular furrow into a dirty reddish-purple central portion covered with a very fine, short, woolly 'duvet', and a peripheral area consisting of four zones, the first (nearest the furrow) red and prominent, the second white and pulverulent, the third dirty white, smooth, glistening, and damp, and the fourth poorly defined and composed of radiating branched hyphae. The fructifications consist of aleuria borne either on simple hyphae (thyrses) or on hyphal clusters, in addition to arthrospores and chlamydospores.

NEGRONI (P.). **Trichophyton lacticolor de la teigne spontanée du cobaye.** [*Trichophyton lacticolor* from spontaneous ringworm of the guinea-pig.]—*Comptes rendus Soc. de Biol.*, cx, 17, pp. 140–141, 1932.

From two cases of ringworm on the heads of guinea-pigs in the Argentine the writer isolated *Trichophyton lacticolor* [*R.A.M.*, x, p. 106], which forms flat, discoid, pulverulent, yellowish-white colonies intersected by shallow furrows on Sabouraud's medium. The fungus is pleomorphic in cultures on media with artificial sugars. The fructifications consist of dense clusters of aleuria in spirals, arthrospores, and chlamydospores. Inoculation experiments on guinea-pigs resulted in the development of typical lesions, followed by spontaneous healing.

EGLĪTS (H.). **Linu slimības un Linseklu kodināšanas megi-nājums 1929–1931. g.** [Flax diseases and Flax seed disinfection experiments during the period 1929 to 1931.]—*Acta Inst. Defens. Plantarum Latviensis*, Riga, ii, pp. 5–32, 1932. [German summary.]

Since the publication of the former report [*R.A.M.*, ix, p. 246] the following additional fungi have been found attacking flax in Latvia: *Polyspora lini* [ibid., x, p. 597], *Diplodina lini* [ibid., x, p. 344], and *Botrytis cinerea* [ibid., viii, p. 151; ix, p. 665], the last-named of which was occasionally observed causing a rot of the tops and seed capsules on weakly plants. The results of continued seed disinfection experiments [which are presented in tabular form] have again confirmed the good effect of the treatment on the yield. The increase in yield of long fibres as a result of seed treatment appears to vary from year to year, in dependence on some as yet undetermined factor or factors; in 1929 it was as high as 35 to 58 per cent., while in 1930 it varied from 3·75 to 13·66 per cent. The best control of seed-borne diseases was given by germisan (short steeping process), while fungicidal dusts (fusariol and tutan) gave less reliable results. Flax seeds treated with germisan or dusted with fusariol or tutan were kept for three months after treatment without any adverse effect on their viability. Seed disinfection also considerably improved the technical qualities of the fibre and the oil content of the seeds.

GRIEVE (B. J.). **Rose diseases and their control.**—*Journ. Dept. Agric. Victoria*, xxx, 7, pp. 362–364, 1 fig., 1932.

The diseases dealt with in this further instalment of the author's series of papers on rose diseases and their control [*R.A.M.*, xi, p. 516] are downy mildew (*Peronospora sparsa*) [ibid., vii, p. 326], not yet recorded in Australia, and grey mould or blossom blight (*Botrytis cinerea*) [ibid., v, p. 491; see also iv, p. 44; vii, p. 721], reported in New South Wales in 1915.

WESTCOTT (CYNTHIA). **Coniothyrium diplodiella (Speg.) Sacc. on Rose.**—*Plant Disease Reporter*, xvi, 11, p. 124, 1932. [Mimeographed.]

A fungus on a rose plant (Madame M. Cazin variety) from France, intercepted at the Bureau of Plant Quarantines, United States

Department of Agriculture, was identified by the writer as *Coniothyrium diplodiella*, the causal organism of white rot of grapes [*R.A.M.*, xi, p. 692]. On the rose the subepidermal, erumpent, oval, conical, or spherical, dark pycnidia, with short beaks or none, measure 121 to 249 μ by 107 to 178 μ (average 197 by 140 μ). The dark brown, uni- to biguttulate, ovoid, lenticular, or navicular conidia measure 7·6 to 13·2 by 4·5 to 9·1 μ (average 10·6 by 6·8 μ) and are borne on conidiophores 13 to 45 μ (average 24 μ) by 2 μ in diameter. This is believed to be the first record of the fungus on rose and possibly on any plant outside the genus *Vitis*.

MARTELL (K.). **Krankheiten der Chrysanthemen.** [Diseases of Chrysanthemums.]—*Gartenflora*, lxxxi, 8, pp. 200–202, 1932.

Popular notes are given on the symptoms and control of some chrysanthemum diseases and pests in Germany, including *Septoria rostrupii*, *S. chrysanthemella*, rust (*Puccinia chrysanthemi*) [*R.A.M.*, ix, p. 247], mildew [*Oidium chrysanthemi*: ibid., ix, p. 456], crown gall (*Bacterium tumefaciens*), *Botrytis cinerea*, and *Verticillium albo-atrum* [cf. ibid., xi, p. 375].

McWHORTER (F. P.) & WEISS (F.). **Diseases of Narcissus.**—*Oregon Agric. Exper. Stat. Bull.* 304, 41 pp., 21 figs., 1932.

Recent tests at the Oregon Agricultural Experiment Station having shown that the so-called 'gray disease' of narcissus (daffodil) is transmissible from infected to healthy plants by leaf mutilation and other mechanical methods applicable to mosaic diseases [*R.A.M.*, x, p. 578], the use of the name mosaic in place of gray disease is now recommended. In addition to the well-known English variety Sir Watkin, which is a conspicuous example of deterioration due to mosaic, a number of other commercial types are affected, including Minister Talma, Cervantes, Weardale Perfection, Lucifer, Orange Phoenix, and Princeps, while van Waveren's Giant and Tresserve are usually very resistant. Some promising new varieties, e.g., Jolyon, have had to be discarded on account of their susceptibility to mosaic. The yield of mosaic stock averages less than 75 per cent. of that of healthy bulbs. A marked symptom in certain varieties, e.g., King Alfred and its hybrids, is a corkscrew twisting of the leaves, while Sir Watkin tends to bend in the plane of the leaf blade. The mottling, marbling, and striping due to the irregular distribution of chlorophyll assume various forms according to the colour and texture of the leaves. Raised, gall-like, elongated areas may develop along the veins. The flowers of mosaic plants are reduced in size, with abnormally thin tissues and short stalks, and they frequently show pronounced hyaline streaks or translucent, cleared areas in the tubes and perianth segments. The latter symptom is particularly noticeable in the vivid yellow varieties, such as Sir Watkin and Weardale Perfection. Some observations are made on various abnormalities liable to confusion with mosaic, together with notes on the spread and control of the disease.

Fungous diseases of narcissus bulbs may be divided into two groups, viz. A (shallow scale and neck rots), including wet scale rot or white mould caused by *Sclerotium rolfsii* (with *S. delphinii*)

[ibid., xi, p. 748] or certain wood-rotting fungi (chiefly *Armillaria mellea*) [ibid., xi, p. 376]; dry scale rot or black scale speck, of which two forms may be distinguished, i.e., a large scale speck apparently caused by a saprophytic sclerotial fungus, and a small scale speck due to an organism closely resembling *Sclerotinia gladioli* [ibid., xi, p. 666]; and neck rot, in part the small scale speck disease and partly due to *Stagonospora curtisii* [ibid., x, pp. 583, 795] and *Botrytis narcissicola* [ibid., xi, p. 460], the causal organisms of leaf scorch and 'smoulder', respectively, as well as to insects and chemical injuries. B (internal scale and basal rots), comprising soft rot (*Rhizopus nigricans*), basal rot (*Fusarium* sp.) [ibid., ix, p. 186; xi, pp. 376, 699], and root plate rot, associated with various fungi. Basal rot is characterized by a fairly dry, chocolate- or purplish-brown decay of the tissues, beginning in the root plate or at the base of the scales and spreading inwards. It is primarily a storage and transit disease but may also attack the bulbs during the later stages of growth in the field. Fairly high temperatures (round 70° F.) are necessary for infection by the basal rot *Fusarium*; if the soil temperature averages 75° to 80° the bulbs are likely to rot in the ground. The large trumpet types are the chief sufferers from basal rot, most of the Incomparabilis, Barri, and Leedsii varieties being resistant while the Polyanthus group is practically immune.

Ramularia blight (*R. vallisumbrosae*) [ibid., x, p. 462] is readily distinguishable from all other narcissus diseases by the conspicuous masses of fluffy white spores covering the leaves, which are rapidly withered so that the bulbs ripen prematurely, besides being reduced in quantity owing to the loss of the shoots.

Full directions are given for the disinfection of narcissus bulbs by various chemical treatments, either in conjunction with hot water or independently. For use after the hot-water treatment the writer recommends ceresan or mercurous chloride (calomel) at the rate of 1 lb. to 8 galls. water, formaldehyde (1 pint to $12\frac{1}{2}$ galls.), or mercuric chloride (1 oz. to 6 galls.). The time of immersion should be one to two minutes for ceresan and calomel, and 15 for formaldehyde and mercuric chloride. If these substances are used independently of the hot-water treatment, the period of immersion should be increased to two to five minutes with ceresan and calomel, and to 30 minutes or one hour with formaldehyde and mercuric chloride. If it is necessary to apply any treatment during storage, the bulbs may either be dipped in ceresan (1 lb. to 10 galls.) for one to two minutes or dusted with ceresan mixed with three parts of talc or hydrated lime.

IKENO (S.). **A preliminary report of a new Septorial leaf-spot disease of the Lily leaves.**—*Agric. & Hort.*, vii, pp. 1421–1439, 2 pl., 1932. (Japanese, with English résumé.) [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (35), 1932.]

Elongated, brown lesions on *Lilium auratum* leaves in Japan are stated to be due to a new species of *Septoria, S. lilii.* On nutrient media some of the mycelial cells swell and develop into chlamydospores; conidia but no pycnidia are produced. The fungus grows between 0° and 32° C. with an optimum at 20° to 24°. The

conidia succumb to ten minutes' immersion in water heated to 53° and to five minutes at 55°.

KOEHLER (B.) & JONES (F. R.). **Alfalfa wilt as influenced by soil temperature and soil moisture.**—*Illinois Agric. Exper. Stat. Bull.* 378, 79 pp., 12 figs., 6 graphs, 1932.

Surveys of the prevalence of bacterial wilt of lucerne (*Phytomonas* [*Aplanobacter*] *insidiosum*) in Illinois [*R.A.M.*, x, pp. 13, 192] in 1925 and again in 1930 show the disease to be on the increase. In the latter year it was estimated to be present in 65 per cent. of the fields of two years old or more in the State.

The results [which are fully discussed and tabulated] of soil and air temperature and soil moisture experiments under controlled conditions indicated that, within a soil temperature range of 10° to 30° C., the percentage of plants successfully inoculated through cut stems increased with rising temperatures. The weight of the roots of the diseased plants was diminished more than that of the tops, so that the conditions of the crops was really poorer than would be judged from their above-ground appearance. The percentage of infection increased with the soil moisture up to 65 per cent. of the water-holding capacity.

The bacteria in naturally infected plants are characteristically lodged in the pits of the vessels against the primary wall. In very young vessels the bacteria were sometimes found in all the pits, while they were usually restricted to rows of pits in older ones, and to only a few of those of full-grown vessels. In artificially inoculated material, on the other hand, the characteristic lodgement of the bacteria in the pits is absent, and the organisms are found attached in masses to the inner thickenings. In infected sweet clover [*Melilotus alba*] roots, the young vessels often contain rounded bacterial masses attached to the series of pits while only a few occupied the lumen. In autumn wood the bacteria may dissolve the middle lamella of the walls of all contiguous cells, thus separating the vascular elements. This phenomenon has not been observed in spring or summer wood, in which the liberation of the organisms is apparently effected by the dissolution of the thin primary wall of the vessel and the development of the bacteria in a thin layer in the middle lamella of contiguous cells.

Comparative chemical analyses showed that the sugar content of diseased lucerne plants is lower and the crude fibre content higher than that of healthy ones.

CARDINELL (H. A.) & GASTON (H. P.). **Comparisons of methods of making spray applications.**—*Michigan Exper. Stat. Special Bull.* 220, 25 pp., 7 figs., 7 graphs, 1932.

The results of orchard experiments [details of which are given] over four years in the State of Michigan showed that adequate control of apple scab [*Venturia inaequalis*] and insect pests is given equally by any of the spraying methods now in common practice, provided the applications are thorough and timely. Where spraying tanks working under pressure were used, a considerable saving in time and materials was realized by one man operating from the top of the tank, as against two men working

together from the ground. All things taken into consideration, the most favourable pressure inside the tank was found to be between 300 and 400 lb. Heavy pruning of the crown of large apple trees did not materially reduce the quantity of spray material used, nor did it give better control of the scab and pests. No significant differences in control or foliage injury were observed between blocks sprayed during the day and at night.

In another series of tests, dusting the trees was found to be between two and three times as rapid as spraying, while giving essentially the same control as the latter method, and the higher cost of the materials was offset by the saving in labour.

HAMILTON (J. M.). **Recent investigations on the control of Apple scab in the Hudson Valley.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 604, 44 pp., 3 graphs, 1932.

The results [which are fully discussed and tabulated] of an extensive series of trials in the Hudson Valley during 1930–1 on the relative efficacy of various methods of apple scab [*Venturia inaequalis*] control indicated that timeliness and thoroughness of application are more important than the selection of any one of the more promising treatments [see preceding abstract]. Lime-sulphur 1 in 40 is recommended as giving the greatest margin of safety of the materials tested, but certain wettable sulphurs, e.g., Koppers flotation sulphur paste 5–50 [*R.A.M.*, xi, p. 520], proved commercially satisfactory, while kolofog 4–50, technically known as bentonite sulphur [ibid., x, p. 671; xi, pp. 385, 560], prepared by the Niagara Sprayer and Chemical Co., was almost equally efficacious. Dry lime-sulphur 5–50, which is approximately equal to the liquid at 1 in 40, also gave good control. The standard dry-mix may be reduced from 16–8–1 to 12–8–1 and the value of the lime is questionable under local conditions. Lime at the rates of 3–50 to 10–50 did not enhance the fungicidal value of lime-sulphur 1 in 40, 1 in 60, and 1 in 80. Lime-sulphur 1 in 40 was the most adherent of the sprays tested, while the greatest loss of sulphur occurred in the dry-mix.

MILLER (E. V.). **Some physiological studies of Gloeosporium perennans and Neofabraea malicorticis.**—*Journ. Agric. Res.*, xlv, 2, pp. 65–77, 2 pl., 11 graphs, 1932.

After a reference to the economic importance in the Pacific North-west of the apple perennial canker (attributed to *Gloeosporium perennans*) [*R.A.M.*, xi, p. 656] and north-western anthracnose (*Neofabraea malicorticis*) [ibid., x, p. 114; cf. also p. 272], the author gives details of his cultural studies of the two organisms, which were undertaken in the hope that their physiological responses might throw some light on their relationship, and also be of value in developing control measures. Both on synthetic media and when inoculated into apple fruit the two fungi responded in a very similar way to increases in temperature from 0° to 20° C., and in apples the radial growth of both fell off slightly between 15° and 20°. Both germinated at 0° and rotted the fruits at that temperature; macrospores were readily obtained on the fruits, their production being very abundant at 10°. The absence from the

nutrient media of potassium chloride or sodium nitrate appeared to have a slight retarding effect on the growth of either organism, and neither was able to start growth at P_H values of 2 and 12; both made similar growth within a P_H range from 3 to 11·8, a definite retardation of initial growth being noted below and above these points. Tannic acid retarded the growth of *N. malicorticis* much more markedly than that of *G. perennans*. It is pointed out that, in general, there was greater variability in the responses of the different strains of the same species than between the two species themselves.

REINECKE (O. S. A.). **Prune production. How to improve size and quality.**—*Farming in South Africa*, vii, 76, pp. 155–156, 1932.

In connexion with a study of the factors affecting the quality of South African d'Agen prunes for export purposes, it is stated that rust [*Puccinia pruni-spinosae*] has a marked adverse effect on the following year's crop, especially after a wet late summer. Affected leaves fall early, before growth has ceased, with the result that the tree comes into flower in the late summer or early winter. The largest and most valuable fruit buds are forced into premature blossoming at this time, so that the following season's crop is substantially reduced. A dormant spray should be given, followed by one or more applications of Bordeaux mixture as soon as the rust appears on the under side of the leaves.

ENDO (S.). **On Cercospora circumscissa Sacc., pathogenic on the leaves of Prunus mume S. et Z.**—*Trans. Tottori Soc. Agric. Sci.*, ii, pp. 249–252, 1931. [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (28), 1932.]

In cultures of *Cercospora circumscissa*, parasitic on *Prunus mume* leaves in Japan [*R.A.M.*, viii, p. 120], chlamydospores develop readily while conidial production is restricted. The optimum temperature for the growth of the fungus was found to be 24° to 28° C.

CATION (D.). **Three virus diseases of the Peach in Michigan.**—*Michigan Agric. Exper. Stat. Circ. Bull.* 146, 11 pp., 2 figs., 1932.

Following a brief historical survey, comparative descriptions are given of three virus diseases affecting peaches in Michigan, viz., yellows, little peach, and red suture, the last-named having steadily increased since its first detection in the State (to which it is apparently confined) in 1911 [*R.A.M.*, x, p. 364]. Yellows was first observed in Michigan in 1863 [cf. ibid., xi, p. 521] and little peach in 1893, the latter being now the more serious disease of the two.

Red suture is most conspicuous during ripening, when the fruit shows an uneven contour, with heavier ridges usually running lengthwise with the suture, the ridge of which may also be abnormally raised. The exposed side of affected fruits shows a deep red to purple blush, which is most intense on the apices of the ridges. The prematurely ripened side of the peach is excessively watery

and readily crushed, and the flavour of the fruit is somewhat insipid. The foliage of diseased trees is yellowish-green or bronzed, and the tips of the leaves unusually pale, while the smaller leaves of a cluster are also often of a lighter colour. In severe cases the leaves turn downward and inward with an occasional twisting of the petiole. Terminal growth is generally curtailed. Leaf clusters frequently sprout from most of the buds on a branch, and numerous short shoots arise along the main branches near the base. Such shoots have shortened internodes and are of small diameter but not long and wiry as in yellows. This feature, together with the abnormal number of leaf clusters near the centre of the tree, gives a feathery or fuzzy appearance characteristic of red suture, and to some extent also of little peach. In June, 1932, the Rochester variety showed marked symptoms of red suture, while South Haven was scarcely affected and the reaction of Elberta, Hale, and Gold Drop was intermediate.

The virus diseases of peach are best controlled by careful cultural methods, including insect extermination, and thorough roguing of infected trees.

WILLISON (R. S.). **Wound-gum in Peaches and Grapes. Its relation to the invasion of fungus wound-parasites.**—*Scient. Agric.*, xii, 7, pp. 402–419; 8, pp. 484–505, 9 pl., 2 figs., 3 graphs, 1932.

A detailed account is given of investigations conducted in Canada to ascertain the nature of the yellow gummy substance produced in the dead arm disease of the vine (*Cryptosporella viticola*) [*R.A.M.*, vii, p. 360] and whether this substance, in which the mycelium of the causal organism is sometimes embedded, is in fact wound gum, whether it is present in uninfected stems, and if so, whether it bars the advance of the fungus. Parallel experiments were made on peach trees inoculated with a *Cytospora* isolated from peach cankers and twigs affected with die-back, and with a *Sclerotinia* [? *S. americana*: ibid., xi, p. 249] obtained from peaches showing brown rot and incipient cankers. The results [which are fully discussed] may briefly be summarized as follows.

When the parenchymatous cells of wood or bark die under certain conditions of temperature and moisture, their contents become changed into yellowish or brownish decomposition products, more or less resistant to solvents. If the cells dry out rapidly, less brown material is produced than is the case when they die under moist conditions; starch, if present, does not disappear under dry conditions. In the peach the decomposition products ooze out into the vessels, forming colourless, later yellow plugs of wound gum which become lignified, especially on the line of demarcation between living and dead wood. The wound gum is insoluble and does not swell in hot or cold water. In vines plugs of wound gum are not formed in the vessels, which contain a jelly formed from the sap; this jelly swells and is at least partially soluble in water. When permeated with the mycelium of *C. viticola* it sometimes turns yellow and resembles wound gum. In the peach, injured meristematic tissue while active forms gum pockets owing to the dissolution of the middle lamellae. These pockets become filled

with gum produced by pectic substances and the disorganization of the cell contents; if exuded, the gum apparently undergoes no further change, remaining partly soluble and quite capable of swelling in water. If it becomes embedded in the wood it acquires the characteristics of wound gum and is often partly or completely impregnated with lignin.

Vine branch tissues discoloured by the presence of the products of decomposition are unable to prevent the wood from becoming invaded by *C. viticola* when there is sufficient moisture to allow the spores to germinate. The hyphae of *Cytospora* and *Sclerotinia* are able to penetrate wound-gum plugs in peach wood, penetration being preceded by the formation of appressoria and effected by means of slender penetration threads. In nature, *Sclerotinia* is found in the wound-gum regions, but is unable to survive, probably owing to insufficient moisture; *Cytospora*, however, lives on from year to year in wood impregnated with wound gum. The wound-gum region in a wound infected with *Cytospora* was usually much more extensive than in an uninfected wound. Some evidence was obtained that *Cytospora* and *Sclerotinia* secrete a toxin which kills peach wood and promotes the formation of wound gum. The presence of wound gum in peach wood may retard but does not prevent the rate of invasion by *Cytospora*; it appears, however, to arrest the progress of *Sclerotinia*.

A bibliography of 43 titles is appended.

JOËSSEL (P. H.) & BORDAS (J.). **Recherches sur les dépérissements de l'Abricotier dans la vallée du Rhône (1927 à 1930).**—[Researches into Apricot die-back in the Rhone Valley (1927 to 1930).]—*Ann. des Épiphyties*, xviii, 5, pp. 325–359, 7 pl., 5 figs., 1 map, 1931. [Received August, 1932.]

In this fully documented account of the different forms of die-back to which apricots in the Rhone valley are susceptible [*R.A.M.*, xi, pp. 23, 187], the authors state that the root rot caused by *Armillaria mellea* apparently bears no relation to progressive reduction in the lime content of the soil, being present, for instance, in an orchard where the soil contained 55·3 per cent. of carbonate of lime. This observation is in direct contrast with that reported by Gard on walnut root rot caused by the same fungus [ibid., vii, p. 686]. *Monilia* [*Sclerotinia cinerea*; ibid., viii, p. 581] may, by weakening the trees, indirectly induce die-back, the dead parts serving as the starting points of necroses caused by other fungi which spread to fresh areas of the wood. As regards apoplexy [ibid., v, p. 304; ix, p. 256; x, p. 529], the cause of which has not yet definitely been ascertained, the authors state that no one symptom can be regarded as diagnostic of this condition, brown discolorations of the phloem, regarded by Chabrolin as specific, being found in other trees affected by other diseases, as well as in apricots affected by root rot or insect attack.

A large number of the cases of apricot die-back appear to be associated with brown patches in the wood originating, as a rule, in dead parts carelessly left on the tree or in injuries sustained in the nursery or during pruning operations, &c. These necrosed

areas may be present in perfectly healthy trees; die-back and death ensue when they spread to an important part of the vascular system, this spread preceding, at least very frequently, any discoloration of the phloem. While *Verticillium dahliae* [ibid., ix, p. 256; xi, pp. 23, 550] is apparently, particularly active in producing this brown discoloration, other organisms have been proved equally capable of causing similar lesions. Verticilliosis is, in the authors' opinion, only one of the causes of die-back.

The view that the many different forms of apricot die-back all originate from lesions in the wood accords, on the one hand, with the morbid symptoms (probably due to reduced circulation of sap) shown by the trees and, in the other, with the spread of die-back throughout the Rhone valley. The high mortality is due to insufficient care and not, in all probability, to the presence of a new parasite.

A bibliography of 50 titles is appended.

HARRIS (J. B.). **Die back of Apricot trees in the Barossa district.**—*Journ. Dept. Agric. S. Australia*, xxxv, 12, pp. 1394–1395, 1932.

This is a brief compilation of notes from the relevant literature which, in the author's opinion, may have a bearing on a die-back of apricot trees accompanied by a copious exudation of gum, which of recent years has come into prominence in the Barossa district of South Australia, and the real causes of which have not yet been established.

WAHL (H. A.). **The migration of Bacillus amylovorus in the tissue of the Quince.**—*Journ. Agric. Res.*, xlv, 1, pp. 59–64, 2 pl., 1932.

As shown by the author's investigations [details of which are given], carried out at the Pennsylvania State College, the migration after inoculation of the fireblight organism (*Bacillus amylovorus*) in quince tissues proceeds on the same lines as described by Nixon for the apple [*R.A.M.*, viii, p. 249], and by F. P. Gibbons (unpublished thesis, Pennsylvania State College) for the pear. In all essentials it is also similar to that of *Bacterium tumefaciens* in the tomato [ibid., vii, p. 767], *Bact. tabacum* in tobacco [ibid., viii, p. 408], and *Bact. vignae* in Lima beans [ibid., viii, p. 220]. In the quince, during the first 42 hours from inoculation the organism travelled intercellularly in a narrow cylindrical area in the inner cortex, extending around the stem about 10 cells inward from the epidermis, with the production of schizogenous cavities. Intracellular invasion of the cortex, involving the formation of lysigenous cavities, occurred about 96 hours after inoculation, and death of all the stem tissues took place within 100 hours after this. Within this period, however, the organism could not be seen outside the cortical tissues, though Rosen [ibid., ix, p. 189] has reported invasion of the phloem and cambium in the apple.

ZELLER (S. M.) & VAUGHAN (E. K.). **Crinkle disease of Strawberry.**—*Phytopath.*, xxii, 8, pp. 709–713, 1 fig., 1932.

Crinkle disease of strawberry, which was first observed by

C. E. Schuster and the senior writer in 1925 [*R.A.M.*, viii, p. 295], is stated to be widespread in the Marshall variety in the Pacific Northwest. Other varieties showing the symptoms include Corvallis, Dunlap, Gene, Sear's La Grange, Magoon, Missionary, Nick Ohmer, Norwood, O.S.C. No. 7, Howard 17 (Premier), Redheart (U.S.D.A. No. 632), and U.S.D.A. Nos. 227–A, 400, 520, and 682.

In general appearance and behaviour crinkle belongs to the virus type of disease, closely resembling that described as yellows (xanthosis) from California [ibid., ix, p. 193] which is not believed to occur in Oregon. The two most striking symptoms of the former disease are crinkling and chlorosis of the foliage. The centres of the yellowed spots often become necrotic, reddened at first and then brownish. The chlorosis is generally most pronounced near the margins, but the yellowing may extend in streaks along a few of the veins towards the midrib: most of the veins, however, become 'cleared'. The more or less regular dentation of the normal leaflets is replaced by deeper crenation and a wavy lobing of the margins.

In all cases where the parent plants were healthy the runners remained so, whereas all those from crinkled parents developed the symptoms of the disease sooner or later. Temporary recovery is a noticeable feature of crinkle in certain soils. In plantings less than a year old the disease cannot be recognized with certainty, while in older stocks the parents and most of the runners show the typical symptoms. Where autumn roguing is necessary, therefore, planting in the previous autumn is advisable. Considerable circumstantial evidence [which is briefly adduced] is available in support of the theory that strawberry crinkle is transmitted under field conditions. The practicability of selection and roguing to eliminate crinkle from the Marshall variety has been demonstrated, the former process being adapted to fields containing 10 to 20 per cent. infection and the latter to those with under 5 per cent.

Doidge (E[thel] M.). **'Black spot' of Mangoes.**—*Farming in South Africa*, vii, 75, pp. 89–91, 5 figs., 1932.

The condition commonly known as 'black spot' of mango in South Africa may be due either to *Gloeosporium mangiferae*, sometimes regarded as identical with *Colletotrichum gloeosporioides* [*R.A.M.*, vii, p. 305], or to *Bacillus mangiferae* Doidge (*Ann. Appl. Biol.*, ii, [p. 1], 1915), which is apparently unknown in any other country [cf. *R.A.M.*, xi, p. 698].

Though superficially similar, the symptoms caused by the two organisms may readily be distinguished. *G. mangiferae* produces small, black spots on the open flower panicle, involving the death of groups of flowers and sometimes preventing the setting of the fruit. The spots on the young leaves are dark, circular or angular, and often fall out, giving a shot hole appearance to the foliage. The fruit may be attacked, with the formation of black sunken spots, at any stage of development from the age of a week or two onwards; at this stage extensive dropping occurs. *G. mangiferae*

is further believed to be responsible for 'tear staining' and russeting of the skin.

B. mangiferae produces on the young leaves dark brown or black, slightly raised spots, larger and more definitely angular than those of the anthracnose fungus. Discoloured areas are formed on the stems, which further develop cracks that exude gum. Attacks on the flower stalks result in a heavy fall of flowers and young fruit. The first symptom of infection on young fruits is a small, dark green, water soaked spot, which spreads, darkens, becomes raised, and may also crack and exude gum. Diseased fruits fall from the tree at the slightest current of air and the ground is strewn with decaying material, while those reaching maturity are unsaleable.

Most of the South African varieties are susceptible to *B. mangiferae*, especially the small yellow mango, but some degree of resistance has been shown by the peach type. In addition to the removal of infective material, the growth of a cover crop may serve to reduce the amount of bacterial disease, but no definite system of control can yet be recommended.

KING (N. J.). **Squirter in Bananas. Causes investigated.**—*Queensland Agric. Journ.*, xxxviii, 1, pp. 30–42, 1932.

Field observations in Queensland indicated that squirter disease of bananas [*R.A.M.*, viii, p. 513] is not associated with soil conditions as revealed by chemical analysis, but results from the exposure of ripening fruit to cold weather in the plantation. By arresting certain physiological processes associated with ripening, this exposure renders the fruit subject to complete physiological breakdown during transport. Possibly, a further development of the breakdown process in the tissues is then caused by the sudden and very considerable fluctuations in temperature which occur during transit to the southern markets at certain times of the year, or by contamination at this stage by an organism. In a letter written in 1925, the manager of the Committee of Direction of Fruit Marketing stated that fruit being loaded on to the trains or already in transit during the severe frosts experienced in July reached the southern markets in good condition, whereas other bananas dispatched a week later were very severely attacked. So far, it appears that fruit from North Queensland is not liable to develop the trouble.

If squirter develops in exposed, low-lying parts of a plantation, and is favoured by frosts and the settling of cold air, the only adequate preventive is to eliminate such areas and use more sheltered land. During the very mild winter experienced in south-eastern Queensland in 1931, squirter was less prevalent than it had been for many years.

IKATA (S.). **Studies on 'kurobosi' (black star)-disease of Diospyros kaki.**—*Rept. Okayamaken Agric. Exper. Stat.*, 37, 48 pp., 7 pl., 1932. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (34), 1932.]

Heavy damage is caused on young and mature persimmon (*Diospyros kaki*) plants in Japan by *Fusicladium levieri* Magn.,

with which *F. diospyrae* Hori et Yoshino is regarded as synonymous. Conidia are produced on various standard media and germinate seven to ten days after inoculation on leaves. Under field conditions the mycelium overwinters in the lesions on the branches, and in April new conidiophores are produced. Infection takes place through the cuticle, the fungus penetrating the contact lines of two adjacent epidermal cells, dissolving the middle lamella, and entering the subepidermal intercellular spaces where vesicles are formed from which hyphae extend along the intercellular spaces. These hyphae ultimately destroy the cells without actually entering them.

IKATA (S.). **Supplement to 'Studies on leaf-fall disease of Diospyros kaki'. I.**—*Rept. Okayamaken Agric. Exper. Stat.*, 37, 19 pp., 5 pl., 1932. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (34), 1932.]

Successful inoculation experiments were carried out with *Cercospora kaki*, the causal organism of angular leaf fall of the persimmon (*Diospyros kaki*) in Japan [cf. *R.A.M.*, viii, p. 453]. The incubation periods for inoculation by means of the conidia and mycelium were 29 to 30 and 29 to 31 days, respectively. Entry into the leaf is effected by short secondary or tertiary branches from the germ-tube penetrating the stomata. Cuticular penetration was not observed. The infection tube produced by the short branches enters the sub-stomatal air cavity and forms vesicular swellings from which a number of infection hyphae emerge.

RIVALIER (E.) & SEYDEL (S.). **Cultures minces sur lames gélosées, colorées et examinées in situ en préparations définitives, pour étude des cryptogames microscopiques.** [Thin cultures on slides dipped in agar, stained and examined *in situ* in fixed preparations, for the study of microscopic fungi.] —*Comptes rendus Soc. de Biol.*, cx, 18, pp. 181–184, 1932.

The writers have found the following technique useful in the study of microscopic fungi. Slides are sterilized in Petri dishes or Borrel tubes (preferably the former) by dry heat, dipped in a weak agar medium (2 gm. peptone, 4 gm. glucose, and 1·5 gm. agar per 200 c.c. water), replaced in the dishes or tubes in 2 or 3 c.c. sterilized water, and sown with pure cultures. At the desired stage of growth the cultures are fixed either by osmic or formaldehyde fumes or simply by desiccation at 37° C. for 24 hours, the slides being then totally immersed in a solution of 1 part collodion to 2 parts each of absolute alcohol and ether, dried for several hours at 37°, stained with cotton blue in lactophenol, and mounted (after washing in alcohol at 70°, dehydrating in alcohol at 90° for two minutes, then in anhydrous acetone, toluene, or xylol) in Canada balsam or Dammar resin.

COOK (W. R. I.). **On the occurrence of amoebae in plant tissue.** —*Ann. de Protistologie*, iii, 4 pp. 197–200, 6 figs., 1932.

In the epidermal and cortical cells of the young roots of *Apium nodiflorum* the author observed amoebae [which are described and figured] which divided up into five or six cysts, several small

amoebae ultimately emerging from each and either forming fresh cysts within the plant or migrating to the exterior. No further stages in the life-history were found, and the evidence obtained indicated that the amoeba migrated into the soil as a free-living species. The organism produced no recognizable effect on the host, which showed no pathological changes as a result of its presence even when, as sometimes occurred in the autumn, the majority of the peripheral cells were infected. The cells appeared to suffer no injury and behaved normally both while occupied by the cysts and after the liberated amoebae had left them. The amoebae were in no way connected with stages in the life-history of any species of the Plasmodiophoraceae; the author considers that the organisms reported by Jones [*R.A.M.*, v, p. 686] as producing mosaic-like symptoms in tobacco leaves and which the latter suggested might be a stage of a species of *Plasmodiophora* were, more probably, a species of encysted amoebae which had temporarily entered the leaf and passed through cell walls weakened by the action of the mosaic-producing agency.

KÖHLER (E.). **Allgemeines über Viruskrankheiten bei Pflanzen.** [General information on virus diseases of plants.]—*Angew. Bot.*, xiv, 4, pp. 334–348, 1932.

This is a survey in general terms of the present status of information concerning the virus diseases of plants, discussed under various aspects, such as the nature of the infective principal and its effects on the plant, modes of infection, properties of the viruses, and epidemiology.

DUFRÉNOY (J.). **Die Viruskrankheiten.** [The virus diseases.]—*Phytopath. Zeitschr.*, v, 1, pp. 85–90, 6 figs., 1932.

By means of Borrel's super-coloration technique (*Bull. de Dermatol.*, 9, 1930), the writer detected in the epidermal cells of mosaic tobacco plants bodies analogous to those found by the former worker in the tissues of animals suffering from virus diseases. After immersion in Meves's fluid, eight days' fixation, six hours' steeping in iron tannate, and staining with Ziel's carbol-fuchsin, the cytoplasm showed pink or red spots occupied by numerous minute, sharply defined, homogeneous granules, which were not found in the normal green cells.

The epidermis of *Iris tingitana* was found especially suitable for the study of the effect of mosaic on the chondriome. On fixation with Nemec's compound (formol, potassium bichromate, and chromic acid) and staining with acid fuchsin, the epidermal cells of mosaic leaves [*R.A.M.*, vii, p. 784; x, p. 162] were found to contain mitochondria in a state of active division into granules, while the vacuome simultaneously broke up into a number of vacuoles. At a more advanced stage of infection the mitochondria occur in groups surrounding an aggregation of small vacuoles. The cytoplasm in which the groups of mitochondria occur stains more and more deeply, so that eventually the latter cannot be distinguished. These areas form the so-called 'cell inclusions' or 'X-bodies' of various authors [cf. ibid., xi, p. 21].

Two forms of tulip breaking [ibid., xi, pp. 591, 718] may be dis-

tinguished, namely, 'clear breaking' of red tulips, caused by a deficiency of anthocyanin in the vacuoles, and 'self breaking', characterized by an intensification of the normal anthocyanin pigment to dark red.

FUKUSHI (T.). **A contribution to our knowledge of virus diseases of plants in Japan.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 2–3, pp. 130–141, 1932.

After a general historical discussion on the virus diseases of plants, a list is given of those hitherto recorded in Japan (with the locality and brief literature references), arranged in tabular form according to the families of the hosts. It includes 71 species of plants in 51 genera distributed among 15 families, those newly reported to be affected by mosaic including *Primula obconica* and *P. denticulata*, *Crotalaria juncea* [cf. *R.A.M.*, x, p. 809], carnation, *Iris pumila* and *I. tectorum* [ibid., x, p. 162], and various species of lily.

CHAUDHURI (H.). **Recherches sur la bactérie des nodosités radiculaires du Casuarina equisetifolia.** [Researches on the bacterium of the root nodules of *Casuarina equisetifolia*.]—*Bull. Soc. Bot. de France*, lxxviii, 7–8, pp. 447–452, 2 figs., 1931.

Rod-shaped bacteria, capable of nitrofixation and resembling those occurring in the root nodules of the Leguminosae, were isolated from the coralloid masses found on the roots of *Casuarina equisetifolia* in the sand dunes of Madras [*R.A.M.*, iii, p. 225]. Inoculation experiments on *C. equisetifolia* with bacteria from *Medicago*, *Melilotus*, and *Lathyrus* nodules gave negative results, but four out of 20 potted *C. equisetifolia* plants in sterilized soil developed nodules when inoculated with the crushed nodules from the same host, six non-inoculated controls remaining free. The root nodules appear to be necessary to the development of *C. equisetifolia* only in the sandy soils along the coast where nitrogen is deficient, being absent from the same host in the Punjab and United Provinces [but see next abstract].

PARKER (R. N.). **Casuarina root-nodules.**—*Indian Forester*, lviii, 7, pp. 362–364, 1932.

Contrary to Chaudhuri's statement that root nodules are absent from *Casuarina equisetifolia* in the Punjab and United Provinces in India [see preceding abstract], the writer has found them by thorough and careful inspection on this and other species of *Casuarina* at Dehra Dun (United Provinces). He is, moreover, convinced from observations and experiments that the presence of the nodules is essential to the satisfactory growth of the trees, a marked improvement in the condition of which has been obtained in several cases by the addition of sand in which *C. equisetifolia* bearing nodules had grown, to the soil around the roots.

CARBONE (D.) & KALAJEV (A.). **Ricerche sulle vaccinazione delle piante.** [Researches on the vaccination of plants.]—*Phytopath. Zeitschr.*, v, 1, pp. 85–97, 1932. [German summary.]

Continuing the studies of the first-named writer and Jarach on the artificial immunization of beans [*Phaseolus vulgaris*] against *Botrytis cinerea* [*R.A.M.*, xi, p. 593], it was shown that the immunizing capacity of the fungus extracts varies according to mode of preparation and does not strictly correspond to their toxicity. This invalidates the suggestion that the intensified resistance of the inoculated plants is only an accompaniment of recovery from the disease.

In this connexion it was further shown that plants subjected to various forms of maltreatment, e.g., germination in the presence of sulphuric acid, caffein, or benzoate or salicylate of potassium, or scalding the roots in hot water, were not more resistant than the controls to infection by *B. cinerea*, but on the contrary more susceptible.

In all the plants in both series of tests the fungus develops in the early stages, and only in the preinoculated individuals does the mycelium subsequently disappear and the wound heal. These data support the assumption that vaccinal immunity in plants is a vital, specific phenomenon.

LINK (G. K. K.), LINK (ADELINE de S.), CROSS (G. L.), & WILCOX (HAZEL). **The precipitin-ring test applied to fungi.**—*Proc. Soc. Exper. Biol. & Med.*, xxix, 9, pp. 1278–1281, 1932.

For several years the writers have been engaged on a study of the possible applications of serological technique to various phytopathogenic fungi and their non-pathogenic taxonomic allies. The work was begun with two species of *Fusarium*, viz., *F. conglutinans*, the agent of cabbage yellows, and *F. cubense* [*F. oxysporum*: *R.A.M.*, xi, pp. 306, 624], the causal organism of banana wilt, and extended to a number of other species of *Fusarium* as well as *Ramularia* sp., *Cylindrocarpon album*, *Sclerotinia sclerotiorum*, and *Neurospora tetrasperma* (+and−strains).

Richards's solution proved a suitable medium for all the fungi tested, good mats usually developing after three to four weeks at 20° to 30° C. A method has been devised for recovering the mats, drying them with a minimum of autolysis, and rapidly preparing fungus powders passing a 100-mesh sieve. Intravenous injection of the clear saline extracts of the powders and intraperitoneal injection of saline resuspensions of the extracted residues were shown by experiments on rabbits to give positive results. Clear, potent test antigens were obtained by grinding the powders with ligroin-extracted pumice, followed by extraction with petrol ether and then with saline for 18 hours at 0°, and finally by centrifugation and filtration through coarse filter paper. Tests of the relative efficacy of undiluted sera and of those diluted with glycerine, glucose, and hypertonic salt solution showed that the former were more effective against progressive dilutions of the test antigens. All the fungi tested were found to be antigenic by the precipitin-ring method, titres up to 1 : 25,600 having been obtained. All but one of the 120 animals used in the experiments produced antisera.

FISCHER (R.). **Über den Einfluss des jährlichen Witterungsverlaufes auf die Frequenz von Pflanzenkrankheiten.** [On the influence of the annual course of the weather on the incidence of plant diseases.]—*Phytopath. Zeitschr.*, v, 1, pp. 55–74, 7 graphs, 1932.

Particulars are given of the writer's attempts to establish a correlation between the incidence of parasitic and non-parasitic plant diseases in Austria and deviations from the normal monthly temperature and precipitation means from 1927 to 1931. On the average of the five-year period the parasitic frequency curve reached its apex in August and the non-parasitic in June.

A connexion was observed between the rainfall and the occurrence of bacterial diseases and *Botrytis cinerea*, which were most prevalent in the wet late summers of 1930 and 1931. *Gymnosporangium sabinae* was widespread in 1928, presumably in consequence of the cool, damp weather in May which favoured infection. *Exoascus* [*Taphrina*] *deformans* was abundant on peaches in 1927 after a mild winter and early spring, whereas in 1929, following an abnormally cold corresponding period, it was practically absent. In general, infection by the Erysiphaceae reaches a climax in May or June. Apple and pear scab (*Venturia inaequalis* and *V. pirina*) were specially prevalent in 1928, when very damp conditions obtained. Mention must be made of the numerous specimens of *Ophiobolus* [*graminis* and *O. herpotrichus*] from cereals sent in during the warm, damp weather at the end of June and beginning of July, 1927 [*R.A.M.*, vii, p. 87; ix, p. 586]. Leaf-spotting fungi of the genera *Stigmatea*, *Mycosphaerella*, *Phyllosticta*, *Ascochyta*, *Septoria*, *Cercospora*, and others uniformly attain their maximum virulence in August, when showery weather (as in 1931) is liable to prevail.

SCHAFFNIT (E.). **Aus unserer Versuchstätigkeit mit Wein-, Obst- und Gartengewächsen.** [Notes on our experimental work with vineyard, orchard, and garden plants.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlvii, 25, pp. 471–472; 26, pp. 487–489, 3 figs., 1 graph, 1932.

A summary is given of the writer's investigations, covering a period of ten years at the Bonn Institute for Plant Diseases, on the relations between the nutrition of plants and their susceptibility to fungous infection [*R.A.M.*, ix, p. 472]. Perhaps the main outcome of the experiments was to show that with various well-known parasites, e.g., true and downy mildew of the vine (*Uncinula necator* and *Plasmopara* [*viticola*]), American gooseberry mildew (*Sphaerotheca mors-uvae*), rose mildew [*S. pannosa*], apple mildew (*Podosphaera leucotricha*), leaf fall of currants [*Pseudopeziza ribis*], and shot hole of peach and cherry [*Clasterosporium carpophilum*], infection is promoted by an excess of nitrogen and a shortage of potash [cf. ibid., xi, p. 704]. The incidence of disease was lowest among plants deficient both in nitrogen and phosphoric acid.

SATOH (S.). **Über die Verarbeitung der Zellulose durch einige krankheitserregende Pilze.** [On the transformation of cellu-

lose by some disease-producing fungi.]—*Forsch. aus dem Geb. der Pflanzenkrankh.*, [Kyoto], i, pp. 13–20, 4 figs., 1931. (Japanese summary.) [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (49), 1932.]

The cellulose-dissolving action of the following fungi was confirmed: *Piricularia oryzae*, *Ophiobolus miyabeanus* [*R.A.M.*, xi, p. 536], *Helminthosporium* sp., *Fusarium* sp. (two cultural strains), *Gibberella saubinetii*, and *Rhizoctonia papayae*.

VERPLANCKE (G.). **Étude comparative de Pommes de terre d'origines diverses. I. Résultats des expériences faites en 1931.** [A comparative study of Potatoes of various origins. I. Results of experiments made in 1931.]—*Bull. Inst. Agron. et des Stat. de Recherches Gembloux*, i, 2, pp. 123–145, 1932. [Flemish, German, and English summaries.]

Preliminary notes are given of tests in various parts of Belgium of potato tubers of the Industrie variety grown in Holland and in the Belgian Ardennes, with special reference to the prevalence in them of virus diseases.

Prisopgave om Anvisning til Bekæmpelse af Kartoflens Rodfiltsvamp (Hypochnus solani) og Kartoflens Bladrullesyge. [A prize thesis on directions for the control of violet root rot of Potato (*Hypochnus solani*) and leaf roll disease of Potato.]—*Tidsskr. for Planteavl*, xxxviii, 3, pp. 535–536, 1932.

Full particulars are given of the conditions to be observed by candidates competing for a prize of Kr. 5,000 offered by the Danish Agricultural Economy Society, Copenhagen, at the instigation of the Danish Spirit Factories, Ltd., for a thesis on the control of violet root rot ('rodfiltsvamp') (*Hypochnus* [*Corticium*] *solani*) and leaf roll of potato. Theses must be received before the end of 1937.

ABE (T.). **On the effect of sunlight on the infection of the Rice plant by Piricularia oryzae.**—*Forsch. aus dem Geb. der Pflanzenkrankh.*, [Kyoto], i, pp. 46–53, 1931. (Japanese.) [German abs. in *Japanese Journ. of Botany*, vi, 2, p. (27), 1932.]

Rice seedlings moistened with water containing spores of *Piricularia oryzae* [*R.A.M.*, xi, p. 538] were kept for eight to twelve hours in light or dark frames under otherwise identical conditions. Infection was found to be more intense on the seedlings kept in darkness, so that light evidently inhibits the development of the fungus to some extent.

ABE (T.) & OKAMURA (E.). **On the effect of copper sulphate upon the susceptibility of the Rice plant to the blast disease.**—*Forsch. aus dem Geb. der Pflanzenkrankh.*, [Kyoto], i, pp. 54–70, 1931. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (27), 1932.]

The effect of copper sulphate applied through the roots on the susceptibility of rice (seedlings and adult plants) to blast (*Piricularia oryzae*) [see preceding abstract] was studied in soil and water

cultures. Susceptibility was found to be inversely proportional to the quantity of copper sulphate given. For instance, in young plants, taking the number of disease spots per 100 mm. leaf length as a measure, it is 1,793, 2,262, or 2,925 for $\frac{1}{500,000}$, $\frac{1}{1,000,000}$, or 0 copper sulphate, respectively. Similar ratios were observed in older plants. The development of the plants was inversely proportional to the quantity of copper sulphate used.

HIRAYAMA (S.). **On the influence of osmotic pressure of culture media on the mycelial growth of Piricularia oryzae B. et C.** —*Forsch. aus dem Geb. der Pflanzenkrankh.*, [Kyoto], i, pp. 27–32, 2 figs., 1931. (Japanese, with English summary.) [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (33), 1932.]

Varying quantities of glucose or glycerine were added to potato decoction agar cultures of *Piricularia oryzae* [see preceding abstracts] to make solutions of different osmotic pressure. Mycelial growth was observed to be most vigorous in the media of higher osmotic pressure.

ENDO (S.). **Studies on the Sclerotium diseases of the Rice plant. IV. On the morphology of certain important fungi causing Sclerotium diseases of the Rice plant.**—*Forsch. aus dem Geb. der Pflanzenkrankh.*, [Kyoto], i, pp. 126–148, 1 pl., 1931. [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (28), 1932.]

Seven fungi are enumerated as agents of sclerotial diseases of rice in Japan, with morphological descriptions, namely, *Hypochnus* [*Corticium*] *sasakii*, *Sclerotium oryzae-sativae*, three other species of *Sclerotium*, *Entostroma oryzae* (*S. phyllachoroides*), and *H. centrifugus* [*C. centrifugum*: *R.A.M.*, xi, p. 539].

ENDO (S.). **Studies on the Sclerotium diseases of the Rice plant. V. Ability of overwintering of certain important fungi causing Sclerotium diseases of the Rice plant and their resistance to dry conditions.**—*Forsch. aus dem Geb. der Pflanzenkrankh.*, [Kyoto], i, pp. 149–167, 1931. (Japanese, with English summary.) [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (28), 1932.]

Most of the causal organisms of sclerotial diseases of rice [see preceding abstract] are stated to be capable of overwintering in the soil, either in sclerotial or mycelial form. The sclerotia of some of these fungi kept their viability for 21 months in a desiccator, while others were able to develop profusely after nine months in dry soil [cf. *R.A.M.*, xi, p. 600].

MURRAY (R. K. S.). **Mycologist's report for 1931.**—*Tenth Ann. Rept. Rubber Res. Scheme (Ceylon), 1932*, pp. 14–18, 1932.

During 1931, in the course of the sulphur dusting experiments for the control of rubber mildew (*Oidium heveae*) [*R.A.M.*, xi, pp. 126, 401] in Ceylon, an improved model of the 'Dustejecta' dusting machine manufactured by Messrs. Drake and Fletcher, Ltd., Maidstone, England, was tested, a full report being submitted to the manufacturers and the Ceylon agents.

Laboratory tests of the particle size of proprietary brands of dusting sulphurs showed that 'flotate' sulphur from the Kawah Poetih volcanic deposits in Java [ibid., x, p. 749] was the finest of the tested products but had the drawback that the particles tended to become agglomerated as a result of the hygroscopic nature of the powder, which was ascertained to result from the presence of free acid. The proportion of acid present was determined and it was then removed by neutralizing while wet with sodium carbonate. The powder so produced was perfectly free-flowing and physically ideal for dusting but the method of preparation is unsuitable for use on a field scale. It was found, however, that by mixing freshly burned lime with the 'flotate' sulphur in the proportion of 1 to 10 the lime slaked itself with the moisture, so that a dry, free-flowing powder was obtained.

Evidence was obtained that small quantities of sulphuretted hydrogen were emitted by the action of sulphur on the mycelium and spores of *O. heveae*, from which it is concluded that the gas may play an important part in the fungicidal action of sulphur [cf. ibid., xi, p. 731].

A field experiment was conducted during the south-west monsoon season to test the value in the control of bark rot of *Hevea* rubber [*Phytophthora* spp.: ibid., ix, p. 673; x, p. 79] of a series of special tar emulsions prepared by the South Metropolitan Gas Company, London. These emulsions had the advantage that they could be applied as liquids to dry or moist tapping cuts, drying after a few minutes to form a firm, waterproof film. Three emulsions containing, respectively, 2 per cent., 1 per cent., and no tar acids as the disinfectant principle, were found to give as satisfactory control as the greasy mixture 'brunol', but they were insufficiently stabilized to permit of being stored for any length of time in a tropical climate.

O'Brien (T. E. H.). **Chemist and Chief Technical Officer's report for 1931.**—*Tenth Ann. Rept. Rubber Res. Scheme (Ceylon), 1932*, pp. 11–14, 1932.

Further experiments at the Imperial Institute, London, have confirmed the view previously expressed by the author that the addition of paranitrophenol as a disinfectant to unsmoked sheet rubber leads to unsatisfactory keeping qualities [*R.A.M.*, x, p. 686]. Sheet rubber air-dried at 100° F. has better ageing properties than smoked sheet prepared from the same latex, but air-dried sheet containing paranitrophenol was markedly inferior. Tests are to be conducted with salicylanilide [ibid., xi, p. 679] as a mould preventative for unsmoked sheet rubber.

Verplancke (G.). **L'examen microbiologique du sol.** [The microbiological examination of the soil.]—*Bull. Inst. Agron. et des Stat. de Recherches Gembloux*, i, 1, pp. 35–45, 3 pl. (1 col.), 1932. [Flemish, German, and English summaries.]

A study was made of the various methods used in soil bacteriology, especially that of direct microscopic examination. Cholodny's method (*Arch. für Microbiol.*, i, p. 620, 1930) proved very satisfactory for the determination of the effects of a special

fertilizer on the soil flora of an experimental farm at Gembloux, Belgium. The addition to the soil of potassium, phosphorus, and nitrogen resulted in an increase in the number of fungi per gm. from 44,000 to 187,500. The addition of peptone and urea (1 per cent.) increased the number of fungi from 25,000 to 28,000 and 33,000 per gm. of soil, respectively, while mannite caused a decline to 6,000.

THOM (C.) & HUMFELD (H.). **Notes on the association of micro-organisms and roots.**—*Soil Sci.*, xxxiv, 1, pp. 29–36, 1932.

The writers confirmed the work of previous observers as to the greater prevalence of micro-organisms in the soil in the immediate vicinity of plant roots than elsewhere. Counts were made from the soil around the dug-up roots that could be dislodged by vigorous shaking and also from fibrous roots with the soil adhering to them after shaking. The former gave higher numbers than soil not around roots and the numbers were very greatly increased (sometimes by more than 10 times) when the roots with adhering soil were examined, especially when the roots were rotted by the action of root-rotting fungi. Mould cultures from maize roots in acid soil produced colonies predominantly of *Trichoderma*, while those from alkaline soils yielded chiefly *Penicillium luteum* [*R.A.M.*, ix, p. 799] and allied species of the biverticillate series [ibid., xi, p. 264]. High colony counts of fungi occurred on the very acid and strongly alkaline samples. The inference from these data is that maize roots, penetrating through soil masses of strongly acid or alkaline reaction, still maintain their own reaction between P_H 6 and 7·5, a zone favourable to mould activity.

WEBER (G. F.). **Diseases of Peppers in Florida.**—*Florida Agric. Exper. Stat. Bull.* 244, 46 pp., 38 figs., 1932.

Popular and copiously illustrated notes are given on the symptoms, causes, and control of the following chilli pepper [*Capsicum annuum*] diseases in Florida, where the annual losses from parasitic and physiological disorders are estimated at 15 per cent. of the crop: bacterial spot (*Bacterium vesicatorium*) [*R.A.M.*, ix, p. 580], southern blight (*Sclerotium rolfsii*), *Cercospora* leaf spot or 'frog-eye' (*C. capsici*), anthracnose (*Glomerella cingulata*) the imperfect stages of which are *Gloeosporium piperatum* and *Colletotrichum nigrum*, early blight (*Alternaria solani*), *Phytophthora* blight (*P. capsici*) [ibid., ii, p. 101; x, p. 755], recently detected, and previously apparently reported only from New Mexico and Porto Rico; 'pink joint' (*Sclerotinia sclerotiorum*), bacterial soft rot (*Bacillus aroideae* and *B. carotovorus*), mosaic [ibid., x, p. 809], damping-off (*Rhizoctonia* [*Corticium*] *solani* and *Bact. vesicatorium*), blossom-end rot and blossom blight, the former associated with unbalanced water relations and secondary fungous infections and the latter caused by *Choanephora cucurbitarum* [ibid., ix, p. 205], *Phoma* rot (*P. destructiva*) [ibid., ix, p. 765], soil rot (*Corticium solani*), *Helminthosporium* pod rot (*H. curvulum*) [ibid., v, p. 294], and a pot rot due to an undetermined species of *Cercospora*, differing from *C. capsici*.

ERWIN (A. T.). **The Peppers.**—*Iowa Agric. Exper. Stat. Bull.* 293, pp. 119–152, 10 figs., 2 graphs, 1932.

In connexion with a study of the botany, varietal classification, and cultivation of chilli peppers the author accepts the view that all the cultivated forms belong to a single species, for which the name *Capsicum frutescens* is preferred to *C. annuum*. Brief notes are given on the following diseases of this crop observed on the Iowa Agricultural Experiment Station collection [cf. preceding abstract]: black spot due to a large-spored species of *Alternaria* often associated with sun scald or blossom-end rot, prevalent in 1931 on the Bull Nose varieties; damping-off (probably *Corticium vagum* [*C. solani*], *Sclerotinia sclerotiorum*, and *Pythium de Baryanum*); sclerotial blight (*Sclerotium rolfsii*); mosaic; bud rot (*Mucor* sp.); leaf spot (*Cercospora capsici*); bacterial spot (*Bacterium vesicatorium*); and anthracnose (probably *Vermicularia* [*Colletotrichum*] *capsici*) [*R.A.M.*, x, p. 57; xi, p. 545].

KUNTZ (P. R.). **El mosaico en las nuevas variedades de Caña de Azúcar P.R. 803, P.R. 807, F.C. 916 y S.C. 12(4).** [Mosaic in the new Sugar-Cane varieties P.R. 803, P.R. 807, F.C. 916, and S.C. 12(4).]—*Puerto Rico Estac. Exper. Insul. Circ.* 96, 6 pp., 2 figs., 1932.

An inspection of plots of the newly developed sugar-cane varieties, P.R. 803, P.R. 807, and F.C. 916 in a district of Porto Rico liable to severe mosaic infection showed a low incidence of disease (0·33, 0, and 4 per cent. respectively, compared with 14·66 per cent. in S.C. 12/4). The varieties in question are more prolific yielders than B.H. 10(12) and are considered to be worthy of further trials on a commercial scale.

Report on the work of the Department of Science and Agriculture for the year ending June 30th, 1932.—*Agric. Journ.*, Barbados, i, 2, pp. 1–30, 3 maps, 1932.

In the section of this report dealing with gumming disease of sugar-cane [*Bacterium vascularum*: *R.A.M.*, x, p. 127; xi, p. 75] two maps are given showing the distribution of the disease in Barbados in 1929–30 and 1931. The disease has spread rapidly. To assist in controlling it, B. 891, B. 755, and B.H. 10(12) canes were distributed in the areas proclaimed to be infected under the Mosaic Disease Eradication Act [ibid., viii, p. 815].

B. 891, as well as B. 726 and Ba. 11569, may occasionally develop stem symptoms, though in the latter variety the gumming is not sufficient as yet to cause trouble in the factory. The possibility that Ba. 11569 may eventually become badly attacked with the stem form of the disease is especially unfortunate as this cane has proved of great value in certain parts of the island.

GILMAN (J. C.). **First supplementary list of parasitic fungi from Iowa.**—*Iowa State Coll. Journ. of Sci.*, vi, 4, pp. 357–365, 1932.

Since the publication in 1929 of the previous list of parasitic fungi occurring in Iowa [*R.A.M.*, ix, p. 65], 35 fungi hitherto unre-

corded in the State have been collected and 26 new hosts added. The parasitic fungi known in Iowa now comprise 995 species on 1,035 host plants.

STOREY (H. H.) & LEACH (R.). **Tea yellows disease.**—*Nyasaland Dept. Agric. Bull.* 3 (N.S.), 12 pp., 1932.

A preliminary account is given of experiments started in 1929, in which the authors claim to have established that the serious disease (termed yellows in this paper) of the tea bush in Nyasaland, which Butler suggested may be caused by a virus [*R.A.M.*, viii, p. 203], is really due to a deficiency of sulphur in the tea plant. It occurs both on long cultivated, exhausted soils and on virgin soil of the black, friable type that is distributed irregularly throughout the Mlanje tea district, and is particularly troublesome in young plantations. There is also evidence that it is at its worst during the hot, dry season, and gradually lessens from December onwards. Attempts to remedy the condition of the diseased bushes by applications of fertilizers containing potassium, sodium, nitrogen, and phosphorus, but no sulphur, either failed to bring about any improvement, or in some cases even appeared to have a detrimental effect. Applications of sulphur, on the other hand, in the form of ammonium sulphate, potassium sulphate, sodium sulphate, or magnesium sulphate, or even of pure sulphur, in every case resulted in a marked improvement, badly diseased plots giving as much as 85 per cent. recovery after treatment. Applications of such fertilizers to virgin soil prior to planting tea also greatly facilitated the establishment of the young plants, resulting in uniformly healthy stands, while on untreated virgin soil an average of 36 per cent. yellows plants was observed in 1931 after the first year's growth. A significant diminution in the sulphur content of young leaves and to a lesser extent of older ones and stems, was found in the diseased bushes as compared with the healthy. Finally, tea seedlings grown in a full nutrient solution containing sulphur developed normally, while those grown in the same solution but without sulphur reproduced the exact symptoms of the yellows disease. The omission of the other individual constituents from the solution gave rise to pathological symptoms quite different from those of yellows.

Experiments further showed that tobacco plants grown on the Mlanje black soils and on the red soils of diseased tea areas, developed the characteristic general yellowing of the leaves, which has been shown by American workers to be induced by withholding sulphur from the plant. It is believed, therefore, that tobacco may be used as an indicator of sulphur deficiency in soils intended for tea.

While the investigation gave definite indication that the tea yellows disease is produced without the co-operation of a fungus, there was some evidence that affected plants are more liable to infection by weakly parasitic fungi, of which *Rhizoctonia bataticola* [*Macrophomina phaseoli*] appears to be the most important. Applications of sulphate were successful in curing the disease symptoms in tea plants, the roots of which were known to harbour the fungus.

It is believed that the tea yellows disease may be controlled by applications to the soil in diseased areas of ammonium or potassium sulphate at the rate of 1 oz. per old plant ($\frac{1}{2}$ oz. per young or supply plant), or pure sulphur at the rate of $\frac{1}{4}$ oz. per old and $\frac{1}{8}$ oz. per young plant. Full use should be made of all available kraal manure, as it should contain an appreciable amount of sulphur, especially in its liquid constituents. Good cultivation should also help to keep the trouble in check. The best time to apply the fertilizer is in November, and the bushes treated should not be pruned heavily until the second year after treatment at the earliest, as there was clear evidence that heavy pruning tended to aggravate the disease.

Virus diseases of Tobacco in Nyasaland.—*Nyasaland Dept. Agric. Bull.* 2 (N.S.), 15 pp., 1932.

In this bulletin brief notes are given on the three virus diseases of tobacco that are known to occur in Nyasaland, namely, leaf curl (the transmission of which by white flies [Aleyrodidae] has been confirmed locally), mosaic, and ring spot. In the section dealing with leaf curl, Storey's recent report on this disease in Rhodesia [*R.A.M.*, xi, p. 676] is reproduced in full. In regard to the control measures recommended by this author, it is stated that in Nyasaland the question is complicated by the fact that, besides one or more species of *Vernonia* (native name 'fusa') which local observations have definitely shown to carry the leaf curl virus, similar symptoms were seen in wild tomato plants, cassava, *Canavalia* sp., *Crotalaria usaramoensis*, and Biloxi soya beans, all these plants also supporting whitefly, though there is still some doubt whether the species concerned is the same [*Bemisia gossypiperda*] that transmits cotton leaf curl in the Sudan.

Mosaic was common in the 1931–2 season and caused more harm than leaf curl. There was some indication that certain soil conditions may be a contributory cause of this disease, and work is in hand to establish whether there is any relation between the nitrogen cycle in the soil and the incidence of mosaic. In the note on ring spot [ibid., viii, p. 204], it is stated that while it may not cause serious damage directly, secondary fungi are liable to develop on the lesions, especially a species of *Phyllosticta*.

Gratz (L. O.). **Field and laboratory studies of Tobacco diseases.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30th, 1931*, pp. 176–178, 4 figs., 1931. [Received September, 1932.]

Notes are given on the work of the Tobacco Experiment Station at Quincy, Florida, during 1930–1. In May, 1931, tobacco plants in two widely separated seed-beds near Quincy became attacked by blue mould (*Peronospora hyoscyami*) [*R.A.M.*, x, pp. 629, 630], and a little later the disease was found in a few areas of shaded tobacco. Work on the selection of strains resistant to black shank (*Phytophthora*) [*parasitica nicotianae*] was continued [ibid., x, p. 275].

DUFRÉNOY (J.). **Maladie bactérienne du Tabac dans le sud-ouest de la France.** [A bacterial disease of Tobacco in the south-west of France.]—*Ann. des Épiphyties*, xvii, 6, pp. 446–455, 3 pl., 8 figs., 1931. [Received August, 1932.]

After stating that in 1931, as a result of highly favourable weather conditions, tobacco in the south-west of France was very severely attacked by wildfire (*Bacterium tabacum*), which destroyed many of the seed-beds in May and injured the field crop in July, the author gives a semi-popular account of the disease based on his own researches and those of numerous other workers under the headings etiology, causal organism, host reactions, varietal susceptibility, and control. There is a short bibliography.

DUFRÉNOY (J.) & RADOEFF (A.). **Effets du formol sur la germination et la croissance des plantules de Tabac.** [The effects of formalin on the germination and growth of Tobacco seedlings.] *Comptes rendus Soc. de Biol.*, cx, 20, pp. 386–388, 2 figs., 1932.

Tobacco seeds immersed for 15 minutes in commercial formaldehyde at the rate of 4 c.c. in 50 c.c. water against *Bacterium tabacum* and then rinsed are stated to germinate readily and attain a normal height in 15 days, whereas those treated with the undiluted (40 per cent.) formaldehyde solution usually fail to germinate owing to the inhibition of development of the primary roots.

MCMURTREY (J. E.). **Effect of thallium on growth of Tobacco plants.**—*Science*, N.S., lxxvi, 1960, p. 86, 1932.

In connexion with a study of tobacco frenching [*R.A.M.*, xi, p. 7] in Washington, D.C., thallium nitrate, applied in pot cultures at 35 and 75 p.p.m., was found to produce a decidedly toxic effect, most marked in damp soil, in which the stem was frequently killed at soil level. Thallium nitrate was shown not to be readily leached from the soil, so that possibly much smaller quantities of the element may be toxic if evenly distributed through the soil mass.

The first symptom of thallium poisoning is a retardation of the growth rate and the development of pale green areas along the veins of the upper leaves. The younger leaves show chlorosis extending into the smallest branches of the vascular system, but this symptom does not so characteristically originate at the leaf tip and margins as in the case of typical frenching. Leaves subsequently produced are much distorted and may consist only of a midrib. Proliferation of the lateral buds follows, giving a witches' broom effect.

It cannot yet be definitely stated that tobacco frenching is a result of thallium toxicity, but there is evidently much in common between the growth manifestations of both these conditions.

QUANJER (H. M.) & SILBERSCHMIDT (K.). **Über eine komplexe Viruskrankheit der Tomate.** [On a complex virus disease of the Tomato.]—*Phytopath. Zeitschr.*, v, 1, pp. 75–83, 5 figs., 1932.

The failure of Schaffnit and Müller to demonstrate the complex character of streak necrosis of tobacco by means of inoculation

experiments [*R.A.M.*, x, p. 537] led the authors to undertake further tests at Wageningen, Holland, in which the expressed sap of the Magdeburger Blaue potato was substituted for Industrie. Apparently healthy plants of the former variety bear the virus of acropetal necrosis [ibid., xi, p. 740], the action of which on tomato corresponds to that of the 'latent virus' of Burnett and Jones [ibid., xi, p. 595]. The other component of the inoculum was tobacco mosaic obtained from the Amersfoort plantings which supplied Mayer and Beijerinck with their material (*Landw. Versuchsstat.*, xxxii, p. 451, 1886; *Verh. K. Akad. Wetensch.*, 2e Sect., vi, 5, 1898).

On 5th June, 1931, apical shoots of Magdeburger Blaue potatoes were grafted on to four healthy Ailsa Craig tomato plants, on to another four of which Industrie shoots from known virus-free stock were grafted for comparison. The remaining inoculations were made by rubbing the leaves of tomato plants (four in each test) with the expressed sap of each of the two potato varieties (the Industrie being from the virus-free stock to serve as a control), of tobacco mosaic, and of a mixture of the latter with that of each of the potato varieties, respectively. On examination a fortnight later all the plants inoculated by rubbing the leaves with tobacco mosaic showed the symptoms of common tomato mosaic with unevenness of the foliage. All those similarly inoculated with Magdeburger Blaue sap developed a faint spotting without unevenness of the leaves. All the plants inoculated with a mixture of tobacco mosaic and the Magdeburger Blaue virus showed a very severe form of mosaic, with markedly uneven leaves and an upward rolling of the youngest ones and their pinnae, giving a bird's claw appearance. As in the case of tomato streak [ibid., vii, p. 659], dark stripes developed on the veins, petioles, and stems. All the plants on to which Magdeburger Blaue shoots were grafted developed a somewhat more pronounced spotting than those inoculated by rubbing with the sap from this variety, but no inequalities of the leaf blades. The plants on to which Industrie shoots were grafted remained perfectly healthy. Evidently, therefore, the virus disease under discussion is formed of two components, viz., the well-known tobacco mosaic and an acronecrotic virus.

The necrotic action of the double disease was found to be slight, most of the dark stripes disappearing when the stems were placed in alcohol. Some of the elongated cell groups in the subepidermal tissue were found to contain pale chlorophyll grains but only in a few cases was necrosis demonstrated. The fruits were not affected by the disease.

MAIRE (R.). **Deux maladies des Tomates en Algérie.** [Two Tomato diseases in Algeria.]—*Bull. Soc. Hist. Nat. Afrique du Nord*, xxiii, 5, pp. 119–120, 1932.

Since 1911 there have been frequent attacks of *Bacillus* [*Bacterium*] *solanacearum* on tomatoes grown on the Algerian coast during winter, and on one occasion it caused serious losses. The disease is most severe in cold, wet winters and the plants are most liable to attack when the fruit is just beginning to form. As a

result, however, of carrying out the control measures recommended by the local inspection service (consisting in the destruction of diseased plants, careful aseptic precautions against allowing healthy plants to become contaminated, etc.), the disease has been much reduced since 1927.

Green tomato fruits showed a greyish-white hairy efflorescence due to irritation by the mite *Eriophyes calcladophorus* (Nalepa) which led to cracking of the skin and resulted in a bacterial fruit rot; young tomato fruits are also stated to be similarly attacked in Provence.

LIESAU (O. F.). **Zur Biologie von Didymella lycopersici, dem Erreger der Tomatenkrebskrankheit.** [On the biology of *Didymella lycopersici*, the causal organism of the Tomato canker disease.]—*Phytopath. Zeitschr.*, v, 1, pp. 1–40, 9 figs. 3 graphs, 1932.

A comprehensive account is given of the writer's studies at Bonn-Poppelsdorf on the biology of *Didymella lycopersici*, the causal organism of tomato canker [*R.A.M.*, xi, p. 483].

The fungus was found to enter the plants both through the unwounded epidermis and through the stomata, and to dissolve readily the pectin-containing substances forming the middle lamella of the cell wall. In addition to the enzymes dissolving the cell wall the fungus further produces a toxin destructive to the host cell, the contents of which collapse, while the dead cells shrink and cause constriction of the stem at the point of infection. The excretory products of the fungus grown in Richards's solution were found to produce rapid wilting of cut shoots of tomato, the toxicity being greatest when the cultures were maintained at the optimum temperature (19°–21° C.) for the growth of the fungus. Older plants are more liable to infection by *D. lycopersici* than young ones, and it was also observed that susceptibility to the disease is promoted by a shortage of nitrogen and phosphoric acid.

Inoculation experiments with the canker fungus on a number of Solanaceae gave positive results, showing that it is by no means specialized on tomato. Infection developed readily on *Solanum nigrum*, *Nicandra physaloides*, *Physalis francheti*, and *Atropa belladonna*, pycnidia with germinable spores being formed in 13 days as on tomato, whereas in the case of *Capsicum annuum*, *Datura stramonium*, *Hyoscyamus niger*, *Lycium halimifolium*, tobacco, *Petunia hybrida*, potato, eggplant, *S. dulcamara*, *S. capsicastrum*, and a few other plants, the incubation period was much more protracted. No appreciable differences in resistance to canker were detected among a large number of commercial tomato varieties [which are listed].

The course of infection was found to be strongly influenced by the temperature of the environment, which acts more directly on the host than on the fungus. The resistance of the former was found to be strengthened at 22° C. as compared with 5° to 15°. A high degree of atmospheric humidity is requisite for infection. The minimum temperature for mycelial development was found to be 4° to 5°, with an optimum at 20° and a maximum below 32°, the

corresponding points for spore germination being 4° to 5°, 20° to 24°, and 32°. Seedlings in very acid soils are particularly liable to infection. Spore germination takes place through a hydrogen-ion concentration range of P_H 4·3 to 7·4, mycelial growth occurring from 3·9 to 8·10, with an optimum at 5·23. The viability of the pycnospores was found to extend over a considerable period, germination being normal after three months in the laboratory while spores kept for 14 months germinated with some delay and individual ones even after two years' storage.

Control measures are indicated, based on preventive cultural practices supplemented by regular applications of 0·25 per cent. uspulun to the seedlings.

ZANONI (G.). **La moria degli Olmi e i sostegni vivi della Vite.** [Die-back of Elms and the living supports of the Vine.]—*Rivista Agricola*, xxviii, 642, p. 317, 1932.

As the elms in numerous parts of Italy, including Emilia, the Marches, Tuscany, and Umbria have since 1929 been in rapid process of destruction owing to the disease caused by *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, x, p. 633; xi, p. 610], it has been proposed that they should be replaced by resistant varieties such as *Ulmus pumila*, *U. japonica*, and *U. racemosa* [cf. ibid., xi, p. 484]. If these, however, should prove to be unsuited to Italian conditions, the author suggests that the best trees to replace the elms as living supports for vines (which is one of their most important uses in the areas affected) would be maple [*Acer campestris*] and the nettle tree (*Celtis australis*).

DRAGHETTI (A.). **Il decorso della malattia degli Olmi nel Modenese.** [The progress of the Elm disease in the vicinity of Modena.]—*Ann. R. Staz. Sper. Agraria di Modena*, N.S., ii, pp. 300–304, 1932.

Die-back of elms (*Graphium* [*Ceratostomella*] *ulmi*) [see preceding abstract] first appeared in Emilia in 1929, when it was found in one district only. The following year it was definitely identified, and was present sporadically throughout the entire province, 5 to 10 per cent. of the trees being attacked in three localities and rather fewer than 1 per cent. in the rest of the province. In 1931, the disease spread very noticeably, but the trees still remained healthy in certain large areas which had, however, become much smaller in extent by 1932.

The author considers that growers before planting the resistant *Ulmus pumila* on a large scale should await the results of the investigations being made by the various Italian agricultural research institutes into the suitability of this species of elm to the local conditions. Meantime, all infected material should be at once destroyed.

PEGLION (V.). **La stigmatomicosi delle Nocciuole.** [Stigmatomycosis of Hazel-Nuts.]—Reprinted from *Rendic. Sessioni R. Accad. Sci. Ist. di Bologna, 1931–2*, 7 pp., 1932.

After referring to previous records of the insect transmission of *Nematospora coryli* to various hosts [*R.A.M.*, viii, p. 718; x,

pp. 298, 519; xi, p. 353], the author states that a large percentage of insect-infested hazel nuts [*Corylus avellana*] from various parts of Italy and Sicily showed spore masses of the fungus in the internal wall, the spongy part of the husk, and the seed-coat, indicating penetration during the development of the ovary. He obtained evidence many years ago that infection can occur both when the nuts approach maturity and when they are fully developed, the growth and diffuse sporulation of the fungus in such cases becoming arrested. During May and June, in young nuts, he observed characteristic lesions in the cotyledons, in which *N. coryli* was in active growth, from which he deduced that the spores probably penetrated the stele before the pericarp became lignified. Further observations require to be made during the growth of the ovary to determine whether the fungus is or is not definitely parasitic.

BURKE (E.). **Chlorosis of trees.**—*Plant Physiol.*, vii, 2, pp. 329–334, 1 fig., 1932.

Cottonwood [*Populus deltoides*] trees at the Montana Agricultural Experiment Station are subject to chlorosis, which has been found to be curable by the injection into the trunk of a 0·25 per cent. solution of ferrous sulphate. The same treatment also proved beneficial to chlorotic apple trees in the Bitter Root Valley, where the abnormally high calcium content of the soil (over 14 per cent.) renders the iron unavailable [*R.A.M.*, xi, p. 326]. As an alternative 2 or 3 gm. of ferrous sulphate or ferric nitrate salts may be inserted through holes in the trunk and water added to dissolve them, while a still simpler method of treatment consists in driving 15 to 20 iron nails, 1 to 1¼ in. long, into the trees. Spraying with ferrous sulphate or the application of this substance to the soil proved ineffectual.

HIRT (R. R.). **On the biology of Trametes suaveolens (L.) Fries.**—*Bull. New York State Coll. of Forestry*, v, 1c (*Tech. Publication* 37), 29 pp., 7 pl., 1 diag., 1932.

In view of the increasing economic importance of willow (*Salix*) and poplar (*Populus*) species in the timber industry, attention has been directed to the white heart rot of these trees, especially on low, damp sites, caused by *Trametes suaveolens* [*R.A.M.*, ii, p. 284]. In dead trunks the sapwood is also destroyed. The fruiting bodies of the fungus are readily recognizable by their whiteness and characteristic odour of anise, the latter permeating the decayed wood and even persisting for some time after air drying.

The first microscopical sign of decay is the disappearance of the tertiary wall in the fibre tracheids, followed by the dissolution of the secondary wall. In the final stages, the walls of all the elements are riddled with perforations made by the hyphae in passing from cell to cell. Two kinds of hyphae are discernible, namely, large ones with clamp-connexions and a very fine type without them, the latter being probably responsible for the invasion of healthy wood. Chemical analyses of the normal and decayed heartwood of *S. pentandra* showed that lignin and cellulose were both disintegrated by

the fungus, the latter constituent being mainly attacked [cf. ibid., xi, p. 343].

Basidiospores of *T. suaveolens* were found to retain their viability for over 15 months in the laboratory. Germination was not obtained after exposure to an outdoor temperature of $-19°$ C. During the spring a temporary revival of the sporophores takes place and a crop of viable basidiospores is produced. Germination occurs within 12 to 16 hours and the formation of secondary spores 25 to 30 hours later. In culture certain secondary spores are produced in clusters resembling bulbils. A study of ten monospore cultures of *T. suaveolens* indicated that the fungus is heterothallic, though the sex factors are too complex to describe it as bisexual.

NOJIMA (T.). **Studien über Polyporus japonicus Fries.** [Studies on *Polyporus japonicus* Fries.]—*Forsch. aus dem Geb. der Pflanzenkrankh.*, [Kyoto], i, pp. 175–191, 1 pl., 4 figs., 1931. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 2, pp. (46)–(47), 1932.]

The examination of oak roots naturally infected by *Polyporus japonicus*, supplemented by inoculation experiments, showed that the mycelium is capable of penetrating the cellulose membranes of various cells in the xylem as well as the pores of the vessels round the medullary ray cells. Microchemical investigation of the decay induced in oak wood by artificial inoculation with *P. japonicus* indicated that the fungus belongs to the lignin-dissolving group of white spongy rots [*R.A.M.*, xi, p. 343]. Good growth was made on potato decoction agar and dilute soy-bean agar at 24° to 36° C. while on sawdust or fragments of *Quercus glauca* in Erlenmeyer flasks numerous stalks and occasionally small caps were formed.

KITAJIMA (K.). **Studies on the 'mizogusare-byo' of living 'Hiba' (Thujopsis dolabrata S. et Z.) caused by Fomes robustus Karst. (Résumé.)**—*Bull. Imper. Forestry Exper. Stat.*, Tokyo, 31, pp. 61–62, 3 pl., 1931.

Fomes robustus [*R.A.M.*, vii, p. 406] has been found causing considerable damage to the trunks of 'hiba' (*Thujopsis dolabrata*) trees in the Aomori prefecture, Japan, and is also reported to be parasitic on *Abies sachalinensis* in Hokkaido. The fungus was readily isolated and grew best on carrot and soy-bean agar. The optimum temperature for mycelial growth was found to be between 25° and 32° C., with minima and maxima at 6° to 7° and 37°, respectively.

Microchemical tests and quantitative analyses indicated that *F. robustus* should be placed in the group of lignin-dissolving fungi [cf. ibid., vii, p. 68 and preceding abstract]. It forms black lines in the wood. The phenolic substance contained in 'hiba' wood had previously been shown to be very toxic to most wood-destroying fungi [ibid., viii, p. 4], hence the destructive action of *F. robustus* on the trunk of this tree is of interest.

HEMMI (T.) & NOJIMA (T.). **Über Polyporus mikadoi Lloyd.** [On *Polyporus mikadoi* Lloyd.]—*Fungi* (*Nippon Fungological Soc.*), i, pp. 90–95, 4 figs., 1931. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 2, p. (32), 1932.]

The morphology and wood-decaying action of *Polyporus mikadoi* Lloyd are described.

KAMEI (S.). **On new species of heteroecious Fern rusts.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 2–3, pp. 161–174, 1932.

In the course of recent studies on the life-histories of fern rusts of Japan, the writer established the heteroecious relationships of 15 species (including nine regarded as new), each of which forms its aecidial stage on the needles of *Abies mayriana* and some also occur on other allied species of *Abies*. Latin diagnoses of seven of the new rusts are given, with taxonomic notes, namely, *Uredinopsis woodsiae* on *Woodsia polystichoides* var. *nudiuscula*, *U. athyrii* on *Athyrium filix-foemina* var. *melanolepis*, *U. hirosakiensis* Kamei et Hiratsuka f. sp. nov. on *Dryopteris thelypteris*, *U. intermedia* on *A. acrostichoides* and *A. pterorachis*, *U. ossaeiformis* on *D. dilatata* and *D. monticola* (alternate hosts, in addition to *Abies mayriana*, *A. sachalinensis* and *A. firma*), *Milesina miyabei* on *D. crassirhizoma*, and *M. dryopteridis* on *D. viridescens*.

KAMEI (S.). **Notes on the cultural study of a new species of Hyalopsora.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 2–3, pp. 124–129, 3 figs., 1932.

A hitherto undescribed species of *Hyalopsora* distinct from *H. aspidiotus* [*R.A.M.*, ix, p. 420] has been observed parasitizing *Blechnum spicant* var. *nipponicum*, a common fern growing near or under *Abies mayriana* in the vicinity of Sapporo, Japan. Inoculation experiments on *A. mayriana* seedlings with sporidia from overwintered fronds gave positive results in four out of seven cases. The resulting spermogonia were longer (300 to 500 μ) than those of *Peridermium pycnoconspicuum* [ibid., iii, p. 115] but almost equal in width (100 to 200 μ). The fungus is regarded as a new species of *Hyalopsora*, to which the name *H. aculeata* is given, with a Latin diagnosis. According to Prof. Hiratsuka *B. amabile* is also attacked by this species in the Honshû mountains.

SIGGERS (P. V.). **The brown spot needle blight of longleaf Pine seedlings.**—*Journ. of Forestry*, xxx, 5, pp. 579–593, 1932.

An important leaf disease of yellow pine (*Pinus palustris*) seedlings has attracted attention of recent years in South Carolina, Mississippi, and Louisiana. The causal organism, *Septoria acicola* [*R.A.M.*, ix, p. 280], is apparently only injurious to the foliage within 18 inches of the ground. The winter climate being very mild in the areas under consideration, the fungus is able to develop on the needles throughout the year. In the spring, spores from lesions formed on the foliage of the previous growing season start infection on the young elongating needles. An isolated spot may originate at or below the needle tip, where it soon encircles

the leaf in the form of a narrow brown band, usually not more than one-eighth of an inch long and always with definite margins. In small seedlings the green tissue between the original lesions is killed, apparently without direct invasion by the fungus, and after a few weeks the needle begins to die back from the tip. By the end of the summer a diseased needle shows three different zones, viz., the dead tip, a spotted zone alternating with green tissue, and a lower area of sound green tissue. Sometimes the oldest infected leaves are shed by the late summer, and in severe cases the defoliation is sufficient to cause dwarfing.

A comparison in 1930 of the average of 1,200 plants sprayed with Bordeaux mixture and 900 left untreated in the previous year showed that the average increase in growth of the former was 0·37 in. compared with 0·25 in. for the latter. In a further test, 2,179 seedlings were sprayed with Bordeaux mixture, lime-sulphur, or colloidal sulphur, and 1,963 left untreated; the difference in the average height of the sprayed and unsprayed seedlings was 0·16 in. in favour of the former. In another experiment the amount of diseased needle tissue among sprayed plants was found to be less than 1 per cent., compared with 43 per cent. for the untreated. About 8 per cent. of the mortality (164 plants) was attributed to defoliation caused by *S. acicola* in 1929 and 1930.

The influence of the ground cover on the incidence of brown spot needle blight was clearly shown by a test in which all vegetation except pine seedlings was removed from several plots of natural reproduction, a process resulting in an increase in the average incidence of infection from 24 to 43 per cent. in 1929 and to 68 per cent. in 1930.

Periodic winter burning has been recommended for the control of *S. acicola*. The writer found that a single fire reduces the incidence of infection for the following season (up to one-third the amount on an unburned tract). By the end of the second season the influence of fire was negligible on two out of three areas, while on the third the amount of disease was one-half of that on an unburned tract. A fire burning through six-year rough growth caused 8 per cent. mortality and delayed the height increment of one-sixth of the survivors by destroying the terminal bud. On an adjacent unburned area the mortality from all causes was only four-tenths of 1 per cent.

CARTWRIGHT (K. St. G.). **Diseases of timber.**—*Journ. Brit. Wood Preserving Assoc.*, ii, pp. 19–39, 1932.

In this paper, which was read at a meeting of the Auctioneers' and Estate Agents' Institute, the author gives a brief popular account of the various rots caused in constructional timber by wood-destroying fungi, with special reference to mine and house fungi. Some space is given to a discussion of control measures applicable to dwellings, and a reference is also made to wood-staining organisms and their control. The paper contains a list of the chief fungi which attack standing and felled timber in Great Britain, together with a brief description of the morphological characters permitting of their rapid identification.

FERGUSSON (H.). **Recent developments in wood preservation.**—*Journ. Brit. Wood Preserving Assoc.*, ii, pp. 40–57, 1932.

In this paper, read at a meeting of the British Wood Preserving Association [*R.A.M.*, xi, p. 487], a brief outline is given of the chief methods now in use in various countries for the preservation of large timbers and railway sleepers, with particular reference to impregnation with creosote, which is considered to be the most efficacious for railway engineering purposes and for telegraph poles. This method comprises Boulton's process of boiling the timber (preferably green and unseasoned) under vacuum prior to impregnation; the process known in America as the Lowrie process; and the Rueping or 'empty cell' process [ibid., vi, p. 67]. A passing reference is also made to the methods consisting of impregnating the timber with water-soluble salts, e.g., Boucherie's [ibid., iv, p. 454] and Card's [ibid., viii, p. 4] processes, the former involving the use of mercuric chloride or copper sulphate, and the second the use of an emulsion of zinc chloride and creosote; the recently introduced use of fluorides [ibid., iii, p. 242; iv, p. 388] and silico-fluorides in conjunction with dinitrocresol or salicylic acid; and a proprietary process relying on the production of a copper-chromium compound inside the timber, which appears to be promising.

In a discussion which followed the reading of this paper, the advantages and drawbacks presented by the various creosoting processes were examined at some length, the author defending his view that the best result, in the case of Douglas fir timber, is obtained with Boulton's process which, besides giving good protection against decay, also improves the mechanical properties of the timber.

BRYAN (J.). **Methods of applying antiseptics.**—*Forestry*, vi, 1, pp. 75–81, 1932.

The author gives brief technical details of the chief methods in use for the application of antiseptic preparations to industrial wood and constructional timber, most of which have been already noticed in this *Review* [cf. preceding abstract *et passim*].

CAMPBELL (W. G.). **A chemical approach to the study of wood preservation.**—*Forestry*, vi, 1, pp. 82–89, 1932.

After a brief outline of the questions involved in the problem of the preservation of wood from attacks by decaying organisms, the author gives a summarized review of the work done in the study of the chemistry of the rotting of wood by fungi, the results of which indicate that a solution of the problem may lie in the discovery of substances which, when introduced into the timber, will permanently inhibit the key reactions (oxidation and hydrolysis) which accompany the decaying process.

LINDGREN (R. M.), SCHEFFER (T. C.), & CHAPMAN (A. D.). **Recent chemical treatments for the control of sap stain and mold in southern Pine and hardwood lumber.**—Reprinted from *Southern Lumberman*, 2 pp., 15th May, 1932.

Of the large number of chemicals tested in 1930 in Louisiana for

the control of sap stain and mould in southern pine [*Pinus palustris*] and hardwoods (e.g., sap gum [? *Liquidambar styraciflua*], yellow poplar [*Liriodendron tulipifera*], and magnolia) lumber [*R.A.M.*, x, p. 355], only ethyl mercury phosphate, ethyl mercury chloride, sodium orthophenylphenolate, soda, and borax were selected for commercial scale tests on the first-named. In 1931 two further treatments gave promising results, namely, sodium tetrachlorophenolate and sodium 2-chloro-orthophenylphenolate.

Of the substances tested on a large scale in 1930, ethyl mercury chloride and ethyl mercury phosphate gave practically equal control of stain in pine, followed by sodium orthophenylphenolate. Soda, which forms the basis of the compounds used in current treating practices, reduced the incidence of stain appreciably but was much less effective than the foregoing. On hardwoods commercial borax and ethyl mercury phosphate gave equally good control of stain, while ethyl mercury chloride was also satisfactory on sap gum. In 1931 both hardwood and pine logs were immersed for 10 to 15 seconds in solutions at air temperature of the most effective compounds previously tested. After 60 to 90 days' seasoning stain was found to have been well controlled on the hardwoods by 5 per cent. commercial borax, 0·24 per cent. lignasan (ethyl mercury chloride plus inert ingredients), and 0·48 per cent. sodium tetrachlorophenolate. In the case of pine, lignasan, the most effective material in 1930, proved definitely superior to all other treatments at one mill, while in a second series of tests it was slightly inferior to both sodium tetrachlorophenolate and sodium orthophenylphenolate. Of the treatments tested to date, lignasan is the only one that has come into extensive commercial use, but further work is considered essential before definite recommendations can be made for the general adoption of any of the substances used in the present trials.

KITAJIMA (K.) & KAWAMURA (J.). **Über die antiseptische Wirkung der höheren Fettsäuren gegen holzzerstörende Pilze.** [On the antiseptic action of the higher fatty acids towards wood-destroying fungi.]—*Bull. Imper. Forestry Exper. Stat.*, Tokyo, 31, pp. 108–113, 1931.

In connexion with the detection in the etheric oil of 'hiba' (*Thujopsis dolabrata*) of an unsaturated, very strongly antiseptic carbonic acid, probably l-rhodic or menthonic acid, the writers tested the action of a number of fatty acids containing 5 to 18 carbon atoms towards the wood-destroying fungi, *Poria vaporaria* and *Paxillus panuoides* [*R.A.M.*, xi, p. 488] on a medium consisting of malt extract, Liebig's meat extract, and agar.

The results [which are tabulated] showed that 0·01 to 0·10 per cent. concentrations of n-valeric acid (5 carbon atoms), n-caproic acid (6), caprylic acid (8), pelargonic acid (9), n-capric acid (10), menthonic acid (10), citronellic acid (10), geranic acid (10), and undecylic acid (11) inhibited the growth of the organisms. On the other hand, lauric acid (12) and others containing a larger number of carbon atoms were less effective against the fungi, as was also the case with the oxalic acid (2 carbon atoms) and glutaric acid (5).

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